# **ENGINE CONTROL SYSTEM**



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Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the "Type approval number" on the identification plate. Refer to GI-43, "IDENTIFICATION PLATE".

Type approval number	Model
Available	With Euro-OBD system
Not available (blank).	Without Euro-OBD system

### **MODELS WITH EURO-OBD SYSTEM Alphabetical Index for DTC**

NFEC0001S03

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<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

#### NOTE:

Regarding A33 models, "-B1" and "BK1" indicate bank 1 and "-B2" and "BK2" indicate bank 2.

#### P No. Index for DTC

NFEC0001S0302 Items DTC\*1 Reference page (CONSULT-II screen terms) Unable to access ECM EC-109 NO DTC IS DETECTED. P0000 **FURTHER TESTING** MAY BE REQUIRED. P0100 MAF SEN/CIRCUIT\*3 EC-139 P0110 AIR TEMP SEN/CIRC EC-146 P0115 COOLANT T SEN/CIRC\*3 EC-151 THRTL POS SEN/CIRC\*3 P0120 EC-156 P0130 HO2S1 (B1) EC-165 P0131 HO2S1 (B1) EC-175 P0132 HO2S1 (B1) EC-183 P0133 HO2S1 (B1) EC-191 P0134 HO2S1 (B1) EC-204 P0135 HO2S1 HTR (B1) EC-212 P0137 HO2S2 (B1) EC-219 HO2S2 (B1) P0138 EC-230 P0139 HO2S2 (B1) EC-241 P0140 HO2S2 (B1) EC-252 P0141 HO2S2 HTR (B1) EC-261 P0150 HO2S1 (B2) EC-165 P0151 HO2S1 (B2) EC-175 P0152 HO2S1 (B2) EC-183

<sup>\*2:</sup> This DTC is displayed with CONSULT-II only.

<sup>\*3:</sup> When the fail-safe operation occurs, the MI illuminates.

<sup>\*4:</sup> The MI illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

DTC*1	Items (CONSULT-II screen terms)	Reference page
P0153	HO2S1 (B2)	EC-191
P0154	HO2S1 (B2)	EC-204
P0155	HO2S1 HTR (B2)	EC-212
P0157	HO2S2 (B2)	EC-219
P0158	HO2S2 (B2)	EC-230
P0159	HO2S2 (B2)	EC-241
P0160	HO2S2 (B2)	EC-252
P0161	HO2S2 HTR (B2)	EC-261
P0171	FUEL SYS-LEAN/BK1	EC-268
P0172	FUEL SYS-RICH/BK1	EC-276
P0174	FUEL SYS-LEAN/BK2	EC-268
P0175	FUEL SYS-RICH/BK2	EC-276
P0180	FUEL TEMP SEN/CIRC	EC-283
P0300	MULTI CYL MISFIRE	EC-288
P0301	CYL 1 MISFIRE	EC-288
P0302	CYL 2 MISFIRE	EC-288
P0303	CYL 3 MISFIRE	EC-288
P0304	CYL 4 MISFIRE	EC-288
P0305	CYL 5 MISFIRE	EC-288
P0306	CYL 6 MISFIRE	EC-288
P0325	KNOCK SEN/CIRC-B1	EC-296
P0335	CPS/CIRCUIT (POS)	EC-302
P0340	CAM PS/CIRC (PHS)	EC-310
P0400	EGR SYSTEM	EC-316
P0403	EGR VOL CONT/V CIR	EC-325
P0420	TW CATALYST SYS-B1	EC-332
P0430	TW CATALYST SYS-B2	EC-332
P0443	PURG VOLUME CONT/V	EC-337
P0500	VEH SPEED SEN/CIRC*4	EC-343
P0505	IACV/AAC VLV/CIRC	EC-347
P0510	CLOSED TP SW/CIRC	EC-356
P0605	ECM	EC-365
P0705	PNP SW/CIRC	AT-124
P0710	ATF TEMP SEN/CIRC	AT-130
P0720	VEH SPD SEN/CIR A/T*4	AT-136
P0725	ENGINE SPEED SIG	AT-141
P0731	A/T 1ST GR FNCTN	AT-146

Alphabetical & P No. Index for DTC (Cont'd)

DTC*1	Items (CONSULT-II screen terms)	Reference page
P0732	A/T 2ND GR FNCTN	AT-152
P0733	A/T 3RD GR FNCTN	AT-158
P0734	A/T 4TH GR FNCTN	AT-164
P0740	TCC SOLENOID/CIRC	AT-173
P0745	L/PRESS SOL/CIRC	AT-178
P0750	SFT SOL A/CIRC*3	AT-184
P0755	SFT SOL B/CIRC*3	AT-189
P1131	SWIRL CONT SOL/V	EC-368
P1217	ENG OVER TEMP	EC-375
P1335	CPS/CIRCUIT (REF)	EC-402
P1336	CPS/CIRC (POS) COG	EC-409
P1401	EGR TEMP SEN/CIRC	EC-417
P1402	EGR SYSTEM	EC-425
P1605	A/T DIAG COMM LINE	EC-434
P1610 - P1615*2	NATS MALFUNCTION	EL-291
P1705	TP SEN/CIRC A/T*3	AT-194
P1706	P-N POS SW/CIRCUIT	EC-437
P1760	O/R CLTCH SOL/CIRC	AT-203

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

#### NOTE:

Regarding A33 models, "-B1" and "BK1" indicate bank 1 and "-B2" and "BK2" indicate bank 2.

<sup>\*2:</sup> This DTC is displayed with CONSULT-II only.

<sup>\*3:</sup> When the fail-safe operation occurs, the MI illuminates.

<sup>\*4:</sup> The MI illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

Alphabetical & P No. Index for DTC (Cont'd)

# MODELS WITHOUT EURO-OBD SYSTEM Alphabetical Index for DTC

=NFEC0001S04

X: Applicable —: Not applicable

Items	С	DTC	
(CONSULT-II screen terms)	CONSULT-II	ECM*1	Reference page
Unable to access ECM	_	_	EC-109
CAM PS/CIRC (PHS)	P0340	0340	EC-310
COOLANT T SEN/CIRC	P0115	0115	EC-151
CPS/CIRC (POS) COG	P1336	1336	EC-409
CPS/CIRCUIT (REF)	P1335	1335	EC-402
ECM	P0605	0605	EC-365
ENG OVER TEMP	P1217	1217	EC-375
HO2S1 (B1)	P0130	0130	EC-165
IGN SIGNAL-PRIMARY	P1320	1320	EC-391
KNOCK SEN/CIRC-B1	P0325	0325	EC-296
MAF SEN/CIRCUIT	P0100	0100	EC-139
NATS MALFUNCTION	P1610 - P1615	_	EL-291
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	0000	_
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*2	EC-62
THRTL POS SEN/CIRC	P0120	0120	EC-156

#### NOTE:

Regarding A33 models, "-B1" indicates bank 1 and "-B2" indicates bank 2.

### P No. Index for DTC

X: Applicable —: Not applicable

DTC		Items	Potoronoo nago	
CONSULT-II	ECM*1	(CONSULT-II screen terms)	Reference page	
_	_	Unable to access ECM	EC-109	
No DTC	Flashing*2	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-62	
P0000	0000	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	_	
P0100	0100	MAF SEN/CIRCUIT	EC-139	
P0115	0115	COOLANT T SEN/CIRC	EC-151	
P0120	0120	THRTL POS SEN/CIRC	EC-156	
P0130	0130	HO2S1 (B1)	EC-165	
P0325	0325	KNOCK SEN/CIRC-B1	EC-296	

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results).

<sup>\*2:</sup> While engine is running.

Alphabetical & P No. Index for DTC (Cont'd)

DTC		Items	Deference ness	
CONSULT-II	ECM*1	(CONSULT-II screen terms)	Reference page	
P0340	0340	CAM PS/CIRC (PHS)	EC-310	
P0605	0605	ECM	EC-365	
P1217	1217	ENG OVER TEMP	EC-375	
P1320	1320	IGN SIGNAL-PRIMARY	EC-391	
P1335	1335	CPS/CIRCUIT (REF)	EC-402	
P1336	1336	CPS/CIRC (POS) COG	EC-409	
P1610 - P1615	_	NATS MALFUNCTION	EL-291	

#### NOTE:

Regarding A33 models, "-B1" indicates bank 1 and "-B2" indicates bank 2.

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results).

<sup>\*2:</sup> While engine is running.

# Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL A33 is as follows (The composition varies according to optional equipment.):

- For a frontal collision
  - The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  - The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), satellite sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the RS section of this Service Manual.

#### **WARNING:**

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation or tape either just before the harness connectors or for the complete harness are related to the SRS.

# Precautions for On Board Diagnostic (OBD) System of Engine

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

#### **CAUTION:**

- Be sure to turn the ignition switch OFF and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.
- Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will
  cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease,
  dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slidelocking type harness connector. For description and how to disconnect, refer to EL section, "Description", "HARNESS CONNECTOR".
- Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.

# **Engine Fuel & Emission Control System**

NFEC0004

**BATTERY** 

• Always use a 12 volt battery as

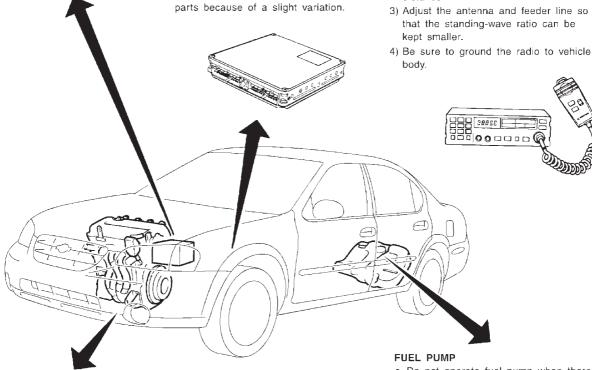
- Do not disassemble ECM.
- · Do not turn dignosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM

The ECM will now start to self-control power source. at its initial value. Engine operation can · Do not attempt to disconnect battery vary slightly when the terminal is cables while engine is running. disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

**ECM** 

#### WIRELESS EQUIPMENT

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
- 1) Keep the antenna as far away as possible from the ECM.
- 2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
  - Do not let them run parallel for a long distance.



#### ENGINE CONTROL PARTS HANDLING

- · Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- · Do not shock or jar the camshaft position sensor or crankshaft position sensor.

#### WHEN STARTING

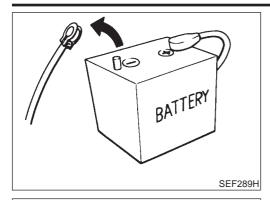
- Do not depress accelerator pedal when
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

- Do not operate fuel pump when there is no fuel in lines.
- · Tighten fuel hose clamps to the specified torque.

#### **ECM HARNESS HANDLING**

- · Securely connect ECM harness connectors.
  - A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in) away from adjacent harnesses to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

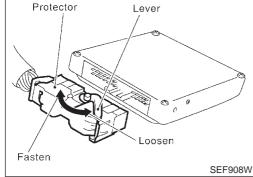
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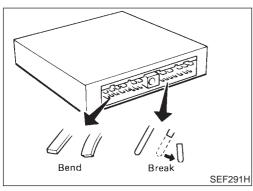
#### **Precautions**

NFEC0005

 Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.

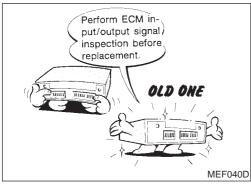


 When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at left.

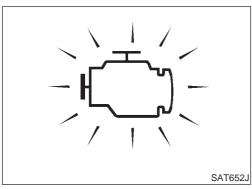


 When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

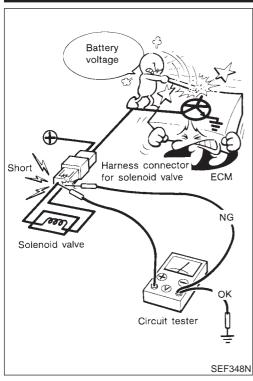


Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-119.

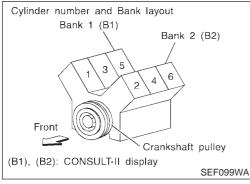


 After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".

The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



Regarding model A33, "Bank 1 (B1)" indicates cylinders number 1, 3, 5 and "Bank 2 (B2)" indicates cylinders number 2, 4, 6 as shown in the figure.

## Wiring Diagrams and Trouble Diagnosis

NFEC0006

When you read Wiring diagrams, refer to the following:

- GI-12, "HOW TO READ WIRING DIAGRAMS"
- EL-9, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-35, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-23. "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"

# **Special Service Tools** NFEC0007 Tool number Description Tool name KV10117100 Loosening or tightening front and heated oxygen Heated oxygen sensor sensor 2 (rear)s with 22 mm (0.87 in) hexagon nut 1 (front) wrench Heated oxygen sensor 2 (rear) wrench NT379 KV10117600 Checking fuel pressure with pressure gauge Fuel pressure check adapter NT777

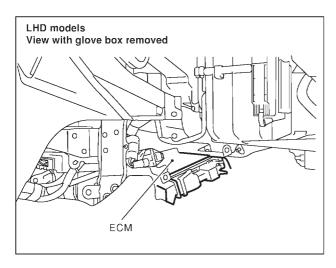
### **Commercial Service Tools** Tool name Description Fuel filler cap adapter Checking fuel tank vacuum relief valve opening pressure NT653 Socket wrench Removing and installing engine coolant temperature sensor 19 mm More than (0.75 in)32 mm (1.26 in) NT705 Oxygen sensor thread Reconditioning the exhaust system threads before Mating cleaner installing a new oxygen sensor. Use with anti-seize surface lubricant shown below. shave a: 18 mm dia. with pitch 1.5 mm for Zirconia cylinder Oxygen Sensor b: 12 mm dia. with pitch 1.25 mm for Titania Oxygen Sensor NT778

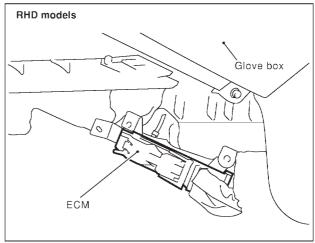
## **PREPARATION**

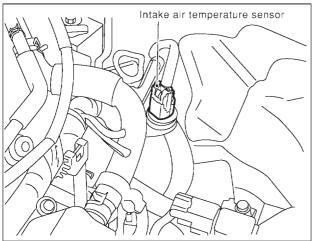
Tool name	Description	
Anti-seize lubricant (Permatex <sup>TM</sup> 133AR or equivalent meeting MIL specification MIL-A-907)	NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

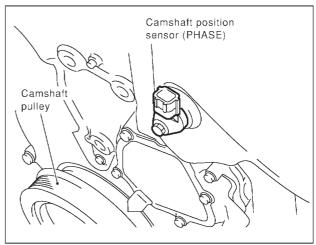
# **Engine Control Component Parts Location** Power valve actuator Throttle position sensor & throttle position switch Fuel damper IACV-AAC valve EVAP canister purge EVAP canister volume control solenoid valve EGR temperature sensor Ignition coil (with power transistor) and spark plug EGR volume control valve Heated oxygen sensor 1 Mass air flow sensor (front) (B1) harness connector Power steering oil pressure switch Camshaft position Refrigerant pressure sensor sensor (PHASE) <sup>1</sup>Intake air temperature sensor Crankshaft position sensor (REF) Knock sensor Rear engine mounting Injector harness connector Ignition coil (with power transistor) and spark plug <sup>1</sup>Crankshaft position sensor (POS) Heated oxygen sensor 1 <sup>1</sup>Engine coolant temperature sensor (front) (B2) harness connector <sup>\</sup>Absolute pressure sensor Heated oxygen sensor 2 (rear) (B2) harness connector <sup>1</sup>Front engine mounting harness connector Heated oxygen sensor 2 'Fuel pressure regulator (rear) (B1) harness connector

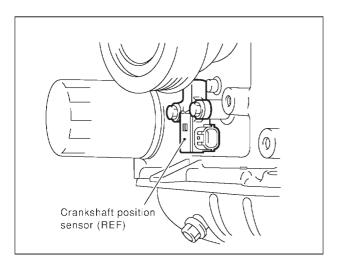
Engine Control Component Parts Location (Cont'd)

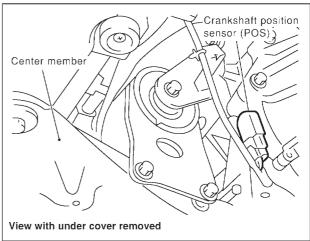




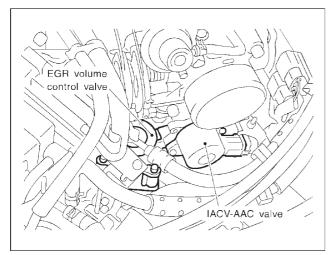


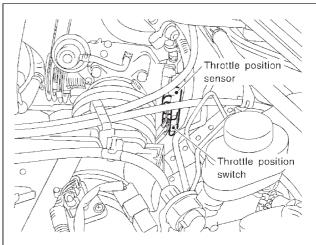


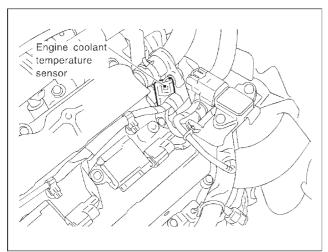


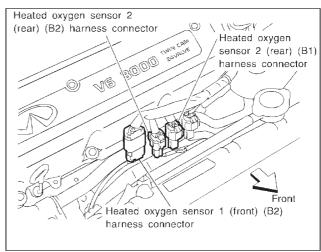


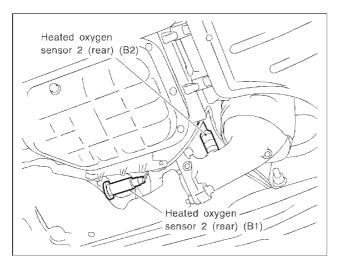
Engine Control Component Parts Location (Cont'd)

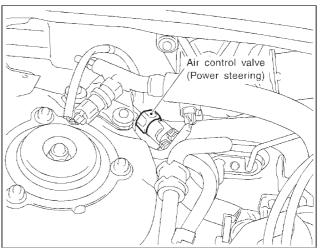






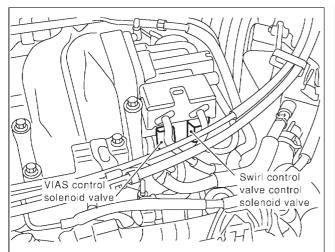


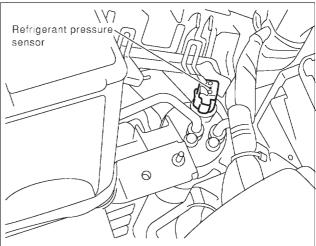


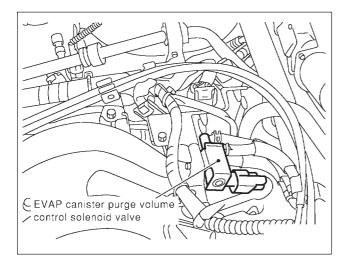


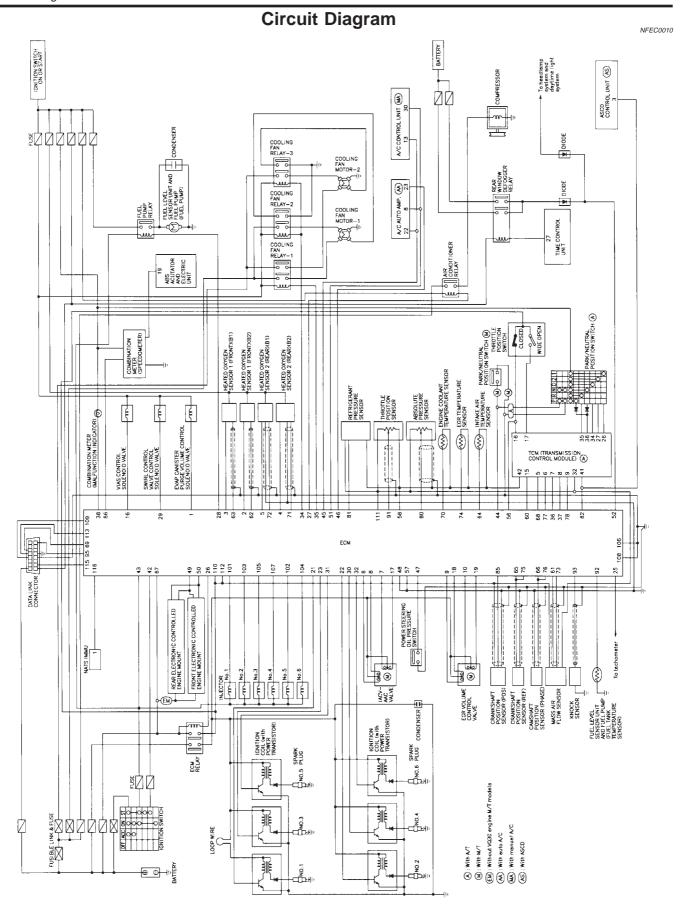
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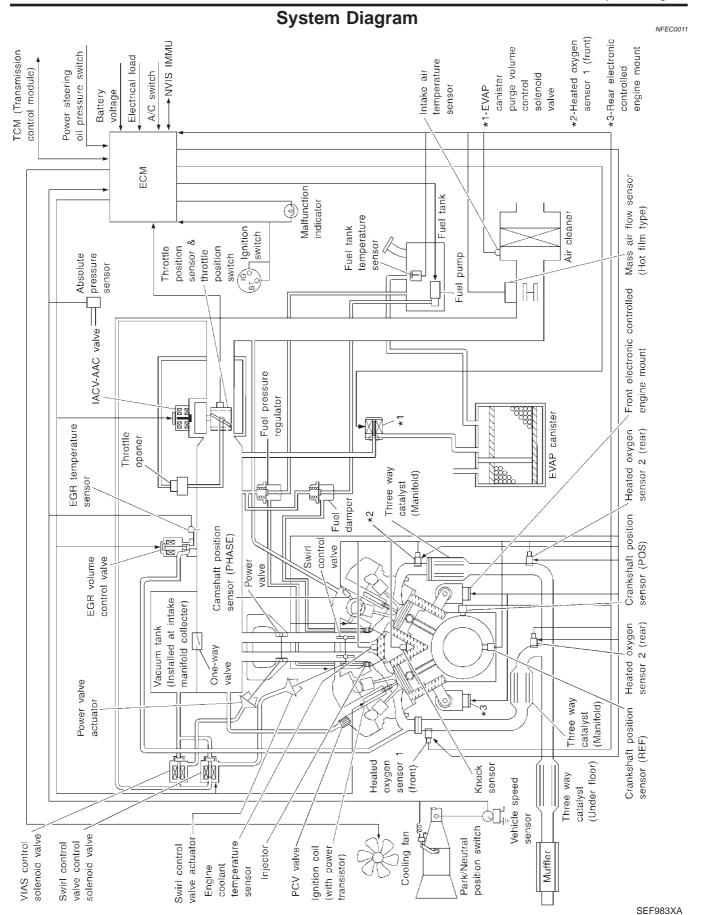
Engine Control Component Parts Location (Cont'd)





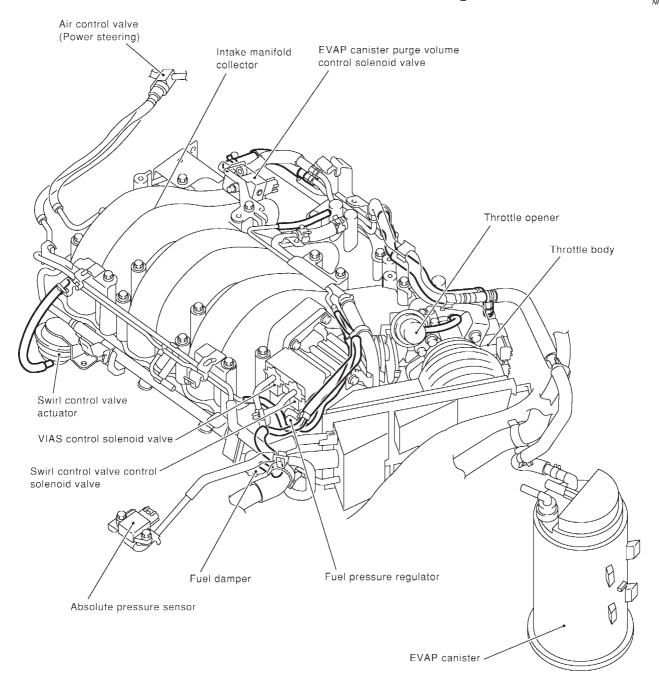






# **Vacuum Hose Drawing**

NFEC0012



#### NOTE:

Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

SEF986XA

Refer to "System Diagram", EC-25 for Vacuum Control System.

System Chart

System Chart NFEC0013				
Input (Sensor)	ECM Function	Output (Actuator)		
Camshaft position sensor (PHASE)	Fuel injection & mixture ratio control	Injectors		
<ul><li>Crankshaft position sensor (REF)</li><li>Mass air flow sensor</li></ul>	Electronic ignition system	Power transistor		
<ul><li>Engine coolant temperature sensor</li><li>Heated oxygen sensor 1 (front)</li></ul>	Idle air control system	IACV-AAC valve		
<ul> <li>Ignition switch</li> </ul>	Fuel pump control	Fuel pump relay		
<ul> <li>Throttle position sensor</li> <li>Closed throttle position switch *3</li> </ul>	On board diagnostic system	MI (On the instrument panel)		
<ul> <li>Park/neutral position (PNP) switch</li> <li>Air conditioner switch</li> </ul>	EGR control	EGR volume control valve		
<ul> <li>Knock sensor</li> <li>EGR temperature sensor *1</li> </ul>	Swirl control valve control	Swirl control valve control solenoid valve		
<ul><li>Intake air temperature sensor</li><li>Absolute pressure sensor</li></ul>	Power valve control	VIAS control solenoid valve		
<ul><li>Battery voltage</li><li>Power steering oil pressure switch</li><li>Vehicle speed sensor</li></ul>	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensor 1 heater (front)		
<ul> <li>Fuel tank temperature sensor *1</li> <li>Crankshaft position sensor (POS)</li> <li>Heated oxygen sensor 2 (rear) *2</li> </ul>	Heated oxygen sensor 2 heater (rear) control	Heated oxygen sensor 2 heater (rear)		
<ul> <li>TCM (Transmission control module)</li> <li>Refrigerant pressure sensor</li> </ul>	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve		
Electrical load	Air conditioning cut control	Air conditioner relay		
	Cooling fan control	Cooling fan relays		

<sup>\*1:</sup> These sensors are not used to control the engine system.

 $<sup>^{\</sup>star}2$ : This sensor is not used to control the engine system under normal conditions.

<sup>\*3:</sup> This switch will operate in place of the throttle position sensor if the sensor malfunctions.

Multiport Fuel Injection (MFI) System

# Multiport Fuel Injection (MFI) System

### **DESCRIPTION** Input/Output Signal Chart

NFEC0014 NFEC0014S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position Throttle valve idle position		Injectors
Park/neutral position (PNP) switch	Gear position	Fuel injection & mixture ratio	
Vehicle speed sensor	Vehicle speed	control	
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Battery	Battery voltage		
Absolute pressure sensor	Ambient air barometric pressure		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 (rear)*1	Density of oxygen in exhaust gas		

<sup>\*1:</sup> Under normal conditions, this sensor is not for engine control operation.

#### **Basic Multiport Fuel Injection System**

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the crankshaft position sensor and the mass air flow sensor.

### Various Fuel Injection Increase/Decrease Compensation

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

#### <Fuel increase>

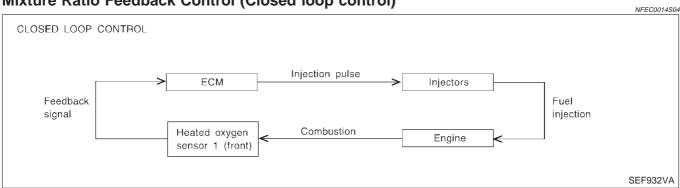
- During warm-up
- When starting the engine
- **During acceleration**
- Hot-engine operation
- When selector lever is changed from "N" to "D"
- High-load, high-speed operation

#### <Fuel decrease>

- **During deceleration**
- During high engine speed operation

Multiport Fuel Injection (MFI) System (Cont'd)

#### Mixture Ratio Feedback Control (Closed loop control)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (Mainfold) can then better reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor 1 (front) in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the heated oxygen sensor 1 (front), refer to EC-165. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 (rear) is located downstream of the three way catalyst (Manifold). Even if the switching characteristics of the heated oxygen sensor 1 (front) shift, the air-fuel ratio is controlled to stoichiometric by the signal from the heated oxygen sensor 2 (rear).

#### **Open Loop Control**

NFEC0014S05

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 (front) or its circuit
- Insufficient activation of heated oxygen sensor 1 (front) at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from "N" to "D"
- When starting the engine

#### Mixture Ratio Self-learning Control

NFEC0014S0

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor 1 (front). This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.

Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.

"Short term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the heated oxygen sensor 1 (front) indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

Multiport Fuel Injection (MFI) System (Cont'd)

#### **Fuel Injection Timing** • Sequential multiport fuel injection system · Simultaneous multiport fuel injection system No. 1 cylinder No. 1 cylinder No. 2 cylinder No. 2 cylinder No. 3 cylinder No. 3 cylinder No. 4 cylinder No. 4 cylinder No. 5 cylinder No. 5 cylinder · No. 6 cylinder -No. 6 cylinder 1 engine cycle 1 engine cycle SEF179U

Two types of systems are used.

#### **Sequential Multiport Fuel Injection System**

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

#### Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The six injectors will then receive the signals two times for each engine cycle.

This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

#### **Fuel Shut-off**

NFEC0014S08

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

## **Electronic Ignition (EI) System**

### **DESCRIPTION** Input/Output Signal Chart

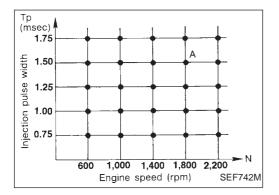
NFEC0015

			NFEC0015S01	
Sensor	Input Signal to ECM	ECM function	Actuator	
Crankshaft position sensor (POS)	Engine speed (POS signal)			
Crankshaft position sensor (REF)	Engine speed (REF signal)	]		
Camshaft position sensor (PHASE)	Piston position	]		
Mass air flow sensor	Amount of intake air	]		
Engine coolant temperature sensor	Engine coolant temperature			
Throttle position sensor	Throttle position Throttle valve idle position	Ignition timing control	Power transistor	
Vehicle speed sensor	Vehicle speed	]		
Ignition switch	Start signal			
Knock sensor	Engine knocking			
Park/neutral position (PNP) switch	Gear position			
Battery	Battery voltage	1		

Electronic Ignition (EI) System (Cont'd)

### **System Description**

NFEC0015S02



The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.

The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

e.g., N: 1,800 rpm, Tp: 1.50 msec

A °BTDC

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

# **Air Conditioning Cut Control**

# DESCRIPTION Input/Output Signal Chart

NFEC0016

NFEC0016S01

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner "ON" signal		Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS)	Engine speed (POS signal)	Air conditioner	
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Vehicle speed sensor	Vehicle speed		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering oil pressure switch	Power steering operation		

#### **System Description**

NFFC0016S02

This system improves engine operation when the air conditioner is used. Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.

Air Conditioning Cut Control (Cont'd)

- · When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

# Fuel Cut Control (at no load & high engine speed)

# DESCRIPTION Input/Output Signal Chart

NFEC0017

NFEC0017S01

			NFEC0017301	
Sensor	Input Signal to ECM	ECM function	Actuator	
Vehicle speed sensor	Vehicle speed	Fuel cut control Inje		
Park/neutral position (PNP) switch	Neutral position			
Throttle position sensor	Throttle position		Injectors	
Engine coolant temperature sensor	Engine coolant temperature	ruei cut control	injectors	
Crankshaft position sensor (POS)	Engine speed (POS signal)			
Crankshaft position sensor (REF)	Engine speed (REF signal)			

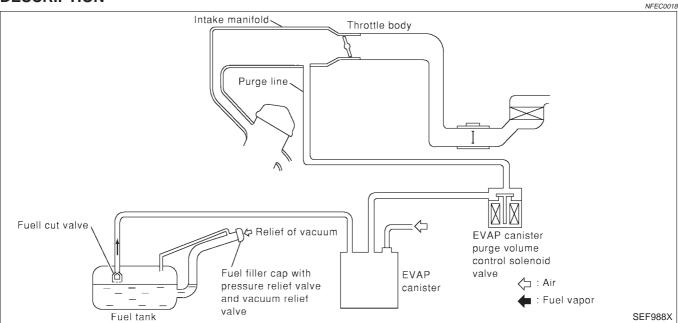
If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

#### NOTE:

This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-28.

### **Evaporative Emission System**

#### DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

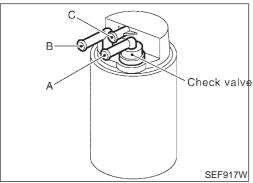
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

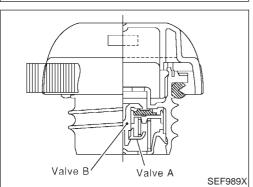
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine

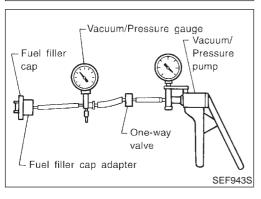
Evaporative Emission System (Cont'd)

operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.







#### INSPECTION

NFEC0019 NFEC0019S01

#### **EVAP Canister**

Check EVAP canister as follows:

- Block port B. Blow air through port A orally. Check that air flows freely through port C with check valve resistance.
- Block port A. Blow air through port B orally. Check that air flows freely through port C.

#### Fuel Tank Vacuum Relief Valve (Built into fuel filler cap)

- Wipe clean valve housing.
- 2. Check valve opening pressure and vacuum.

15.3 - 20.0 kPa (0.1530 - 0.2001 bar, 0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 - 2.90 psi)

#### Vacuum:

-6.0 to -3.4 kPa (-0.0598 to -0.0343 bar, -0.061 to -0.035 kg/cm<sup>2</sup>, -0.87 to -0.50 psi)

3. If out of specification, replace fuel filler cap as an assembly.

### **CAUTION:**

Use only a genuine fuel filler cap as a replacement.

### **Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve**

Refer to EC-337 and EC-509.

NFEC0019S05

#### **Fuel Tank Temperature Sensor**

Refer to EC-283 and EC-486.

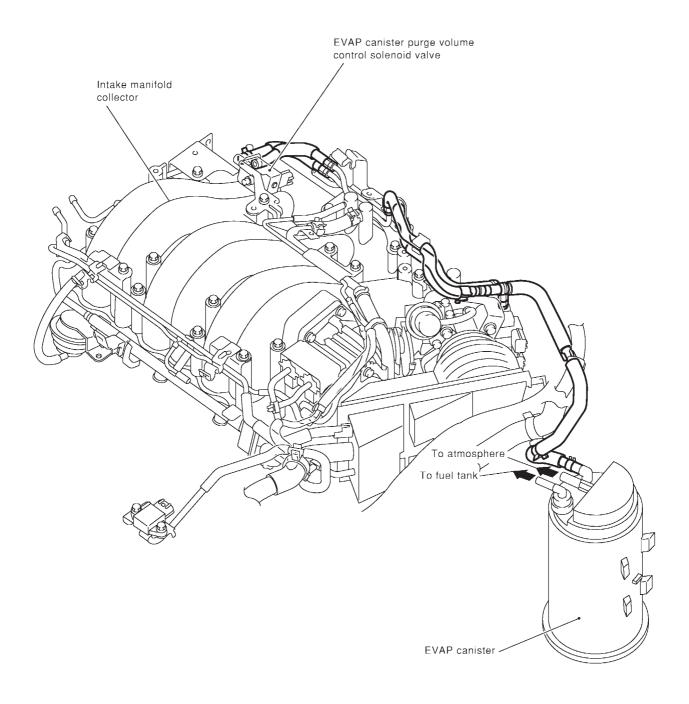
#### **Checking EVAP Vapor Lines**

NFFC0019S06

- 1. Visually inspect vapor lines for leaks, cracks, damage, loose connections, chafing and deterioration.
- Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc. Refer to next page.

#### **EVAPORATIVE EMISSION LINE DRAWING**

NFEC0020



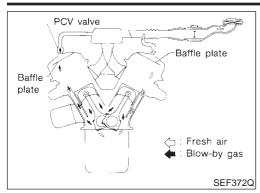
#### NOTE:

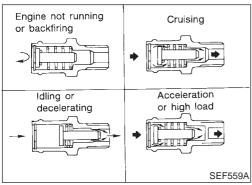
Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

SEF990X

Positive Crankcase Ventilation

NFEC0021







This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

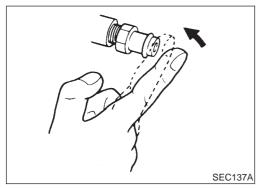
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

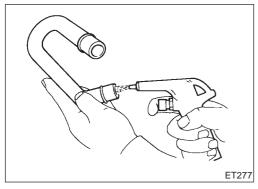


# INSPECTION

### **PCV (Positive Crankcase Ventilation) Valve**

NFEC0022

With engine running at idle, remove PCV valve ventilation hose from PCV valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

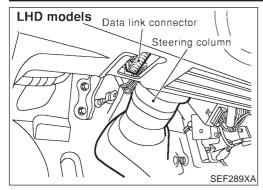


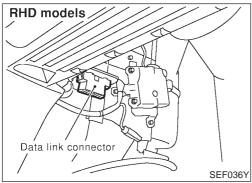
#### **PCV Valve Ventilation Hose**

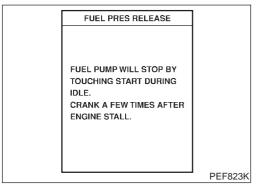
NFEC0022S02

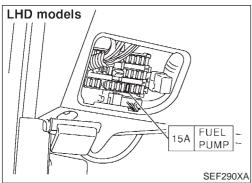
- 1. Check hoses and hose connections for leaks.
- 2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

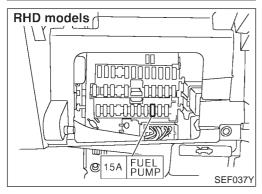
#### **BASIC SERVICE PROCEDURE**











#### **Fuel Pressure Release**

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

### (P) WITH CONSULT-II

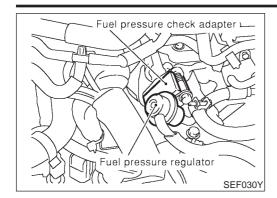
NFEC0023S01

- 1. Turn ignition switch "ON".
- 2. Perform "FUEL PRESSURE RELEASE" in "WORK SUP-PORT" mode with CONSULT-II.
- 3. Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 5. Turn ignition switch "OFF".

# **⊗** WITHOUT CONSULT-II

NFEC0023S02

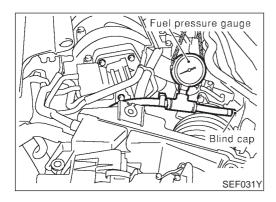
- 1. Remove fuel pump fuse located in fuse box.
- 2. Start engine.
- 3. After engine stalls, crank it two or three times to release all fuel pressure.
- 4. Turn ignition switch "OFF".
- 5. Reinstall fuel pump fuse after servicing fuel system.



### **Fuel Pressure Check**

NEECO024

- When reconnecting fuel line, always use new clamps.
- Make sure that clamp screw does not contact adjacent parts.
- Use a torque driver to tighten clamps.
- Use Pressure Gauge to check fuel pressure.
- Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
- 1. Release fuel pressure to zero.
- 2. Disconnect fuel tube joint between fuel pressure regulator and injector tube and set fuel pressure check adapter (J44321).



- 3. Install pressure gauge to the fuel pressure check adapter as shown in the figure.
- 4. Start engine and check for fuel leakage.
- 5. Read the indication of fuel pressure gauge.

### At idling:

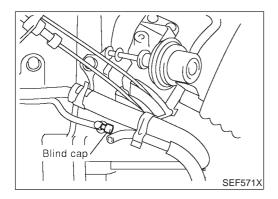
With vacuum hose connected

Approximately 235 kPa (2.35 bar, 2.4 kg/cm<sup>2</sup>, 34 psi)

With vacuum hose disconnected

Approximately 294 kPa (2.94 bar, 3.0 kg/cm<sup>2</sup>, 43 psi)

If results are unsatisfactory, perform Fuel Pressure Regulator Check.



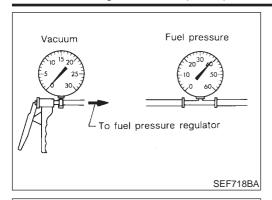
# **Fuel Pressure Regulator Check**

NFEC0025

- 1. Stop engine and disconnect fuel pressure regulator vacuum hose from vacuum gallery.
- 2. Plug vacuum gallery with a blind cap.
- 3. Connect variable vacuum source to fuel pressure regulator.

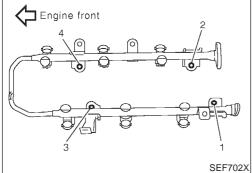
# **BASIC SERVICE PROCEDURE**

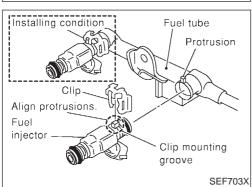
### Fuel Pressure Regulator Check (Cont'd)



4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.



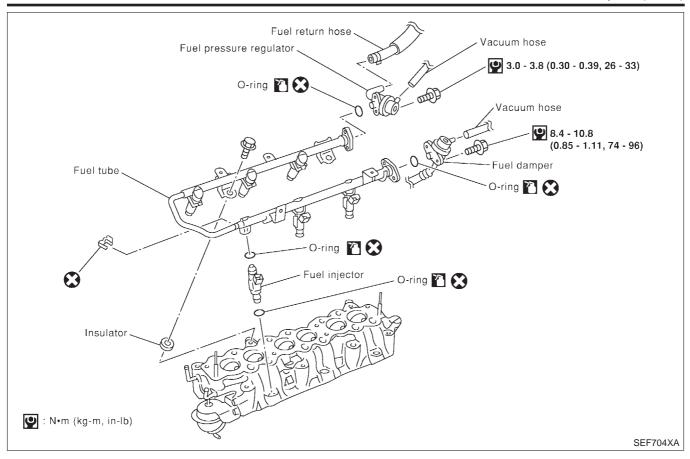


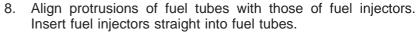
# Injector

### **REMOVAL AND INSTALLATION**

NEEC0026

- . Release fuel pressure to zero.
- Remove intake manifold collector. Refer to EM-18, "TIMING CHAIN".
- 3. Remove fuel tube assemblies in numerical sequence as shown in the figure at left.
- 4. Expand and remove clips securing fuel injectors.
- 5. Extract fuel injectors straight from fuel tubes.
- Be careful not to damage injector nozzles during removal.
- Do not bump or drop fuel injectors.
- Do not disassemble or adjust fuel injectors.
- 6. Carefully install O-rings, including the one used with the pressure regulator.
- Lubricate O-rings with a smear of engine oil.
- Be careful not to damage O-rings with service tools, finger nails or clips. Do not expand or twist O-rings. If stretched, do not insert them into fuel tubes immediately after stretching.
- Discard old clips; replace with new ones.
- 7. Position clips in grooves on fuel injectors.
- Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.





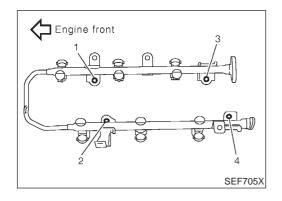
- 9. After properly inserting fuel injectors, check to make sure that fuel tube protrusions are engaged with those of fuel injectors, and that flanges of fuel tubes are engaged with clips.
- 10. Tighten fuel tube assembly mounting nuts in numerical sequence (indicated in the figure at left) and in two stages.

```
Tightening torque N-m (kg-m, ft-lb)
1st stage:
9.3 - 10.8 (1.0 - 1.1, 6.9 - 7.9)
2nd stage:
20.6 - 26.5 (2.1 - 2.7, 16 - 19)
```

11. Install all parts removed in reverse order of removal.

# **CAUTION:**

After properly connecting fuel tube assembly to injector and fuel hose, check connection for fuel leakage.



# **BASIC SERVICE PROCEDURE**

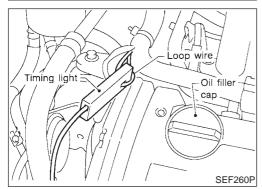
How to Check Idle Speed and Ignition Timing

# DATA MONITOR MONITOR NO DTC ENG SPEED XXX rpm SEF058Y

# How to Check Idle Speed and Ignition Timing **IDLE SPEED**

**Using CONSULT-II** 

Check idle speed in "DATA MONITOR" mode with CONSULT-II.

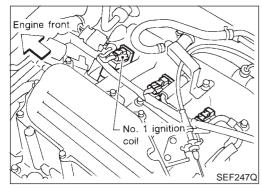


### **IGNITION TIMING**

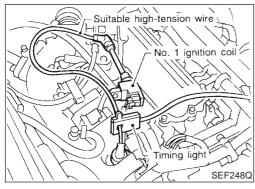
NFEC0607S02

Any of following two methods may be used.

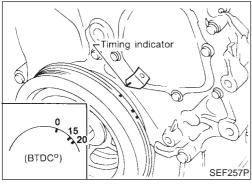
- **Method A**
- Attach timing light to loop wire as shown. a)
- Check ignition timing.

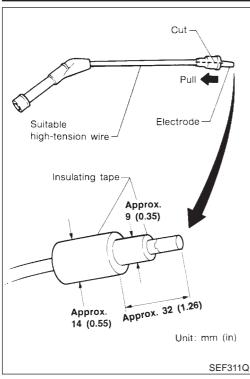


- Method B
- Remove No. 1 ignition coil. a)



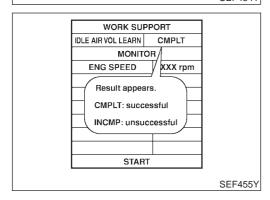
- Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
- c) Check ignition timing.





[	SELECT WORK ITEM	]
	xxxxxxxxx	
	xxxxxxxxx	]
	IDLE AIR VOL LEARN	
	xxxxxxxxx	]
	xxxxxxxxx	]
	xxxxxxxxx	]
		1
		SEF217Z

WORK SUP		
IDLE AIR VOL LEARN		
MONITO	R	1
ENG SPEED		
START		]
		SEF454Y



# Idle Air Volume Learning DESCRIPTION

NFEC0871

NEEC0871S0

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time IACV-AAC valve, throttle body or ECM is replaced.
- Idle speed or ignition timing is out of specification.

#### PRE-CONDITIONING

NFEC0871S

Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied.

Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 99°C (158 210°F)
- PNP switch: ON
- Electric load switch: OFF
   (Air conditioner, headlamp, rear window defogger)

On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.

- Cooling fan motor: Not operating
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up

For A/T models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.

For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

# **OPERATION PROCEDURE**

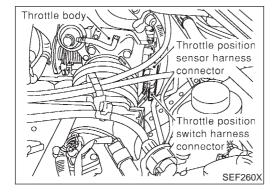
NFEC0871S03

# (P) With CONSULT-II

- . Turn ignition switch "ON" and wait at least 1 second.
- 2. Turn ignition switch "OFF" and wait at least 10 seconds.
  - Turriginilor Switch Of Faria wait at load

- 3. Start engine and warm it up to normal operating temperature.
- 4. Check that all items listed under the topic "PRE-CONDITION-ING" (previously mentioned) are in good order.
- 5. Turn ignition switch "OFF" and wait at least 10 seconds.
- 6. Start the engine and let it idle for at least 30 seconds.
- 7. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 8. Touch "START" and wait 20 seconds.
- Make sure that "CMPLT" is displayed on CONSULT-II screen.
  If "INCMP" is displayed, "Idle Air Volume Learning" will not be
  carried out successfully. In this case, find the cause of the
  problem by referring to the NOTE below.
- 10. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION				
Idle speed	VQ20DE	M/T: 675±50 rpm A/T: 700±50 rpm (in "P" or "N" position)			
	VQ30DE	M/T: 625±50 rpm A/T: 700±50 rpm (in "P" or "N" position)			
Ignition timing	VQ20DE	M/T: 9°±5° BTDC A/T: 9°±5° BTDC (in "P" or "N" position)			
	VQ30DE	M/T: 15°±5° BTDC A/T: 15°±5° BTDC (in "P" or "N" position)			



### **⋈** Without CONSULT-II

NFEC0871S0302

- 1. Turn ignition switch "ON" and wait at least 1 second.
- 2. Turn ignition switch "OFF" and wait at least 10 seconds.
- 3. Start engine and warm it up to normal operating temperature.
- 4. Check that all items listed under the topic "PRE-CONDITION-ING" (previously mentioned) are in good order.
- 5. Turn ignition switch "OFF" and wait at least 10 seconds.
- 6. Start the engine and let it idle for at least 30 seconds.
- Disconnect throttle position sensor harness connector (brown), then reconnect it within 5 seconds.
- 8. Wait 20 seconds.
- 9. Make sure that idle speed is within specifications. If not, the result will be incomplete. In this case, find the cause of the problem by referring to the NOTE below.
- 10. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATI	SPECIFICATION				
Idle speed	VQ20DE	M/T: 675±50 rpm A/T: 700±50 rpm (in "P" or "N" position)				
	VQ30DE	M/T: 625±50 rpm A/T: 700±50 rpm (in "P" or "N" position)				
Ignition timing	VQ20DE	M/T: 9°±5° BTDC A/T: 9°±5° BTDC (in "P" or "N" position)				
	VQ30DE	M/T: 15°±5° BTDC A/T: 15°±5° BTDC (in "P" or "N" position)				

#### NOTE:

If idle air volume learning cannot be performed successfully, proceed as follows:

- 1) Check that throttle valve is fully closed.
- 2) Check PCV valve operation.
- 3) Check that downstream of throttle valve is free from air leakage.
- 4) Adjust closed throttle position switch and reset memory. (Refer to Basic Inspection, EC-92.)
- 5) When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem. It is useful to perform "TROUBLE DIAGNOSIS SPECIFICATION VALUE", EC-127.
- 6) If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform "Idle air volume learning" all over again:
- Engine stalls.
- Erroneous idle.
- Blown fuses related to the IACV-AAC valve system.

### Introduction

#### MODELS WITH EURO-OBD SYSTEM

NFEC0029

NFEC0029S02

The ECM has an on board diagnostic system which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Diagnostic Trouble Code (DTC)	Mode 3 of ISO 15031-5		
Freeze Frame data	Mode 2 of ISO 15031-5		
System Readiness Test (SRT) code	Mode 1 of ISO 15031-5		
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of ISO 15031-5		
1st Trip Freeze Frame data			
Test values and Test limits	Mode 6 of ISO 15031-5		
Calibration ID	Mode 9 of ISO 15031-5		

The above information can be checked using procedures listed in the table below.

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	X	X	X	X	X	_
GST	Х	X*1	Х	_	Х	Х

<sup>\*1: 1</sup>st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-109.)

#### MODELS WITHOUT EURO-OBD SYSTEM

NFEC0029S0

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Diagnostic Trouble Code (DTC)

Freeze Frame data

1st Trip Diagnostic Trouble Code (1st Trip DTC)

1st Trip Freeze Frame data

The above information can be checked using procedures listed in the table below.

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data
CONSULT-II	×	X	X	X
ECM	Х	X*1	_	_

<sup>\*1:</sup> When the DTC and the 1st trip DTC appear on the display simultaneously, it is difficult to clearly distinguish one from the other.

# **Two Trip Detection Logic**

NFEC0030

NFEC0030S01

#### MODELS WITH EURO-OBD SYSTEM

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage <1st trip>.

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored <2nd trip>.

The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MI, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

Two Trip Detection Logic (Cont'd)

X: Applicable —: Not applicable

л. приваве								
		N	<b>1</b> I		DTC		1st trip DTC	
Items	1st	trip	2nd trip		1 ot trip	0.143	4.1.1.	0.165
	Blinking	Lighting up	Blinking	Lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
Misfire (Possible three way catalyst damage)  — DTC: P0300 - P0306 is being detected	Х	_	_	_	_	_	Х	_
Misfire (Possible three way catalyst damage)  — DTC: P0300 - P0306 is being detected	_	_	Х	_	_	Х	_	_
Fail-safe items (Refer to EC-109.)	_	Х	_	_	X*1	_	X*1	_
Except above	_	_	_	Х	_	Х	Х	_

<sup>\*1:</sup> Except "ECM".

#### MODELS WITHOUT EURO-OBD SYSTEM

NEEGOOOGO

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. When the ECM enters the fail-safe mode (Refer to EC-109), the DTC is stored in the ECM memory even in the 1st trip.

# **Emission-related Diagnostic Information**

# MODELS WITH EURO-OBD SYSTEM DTC and 1st Trip DTC

NFEC0031

NFEC0031S09

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MI during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "How to Erase Emission-related Diagnostic Information". Refer to EC-57.

For malfunctions in which 1st trip DTCs are displayed, refer to EC-55. These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.

1st trip DTC is specified in Mode 7 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to page EC-90. Then perform "DTC Confirmation Procedure" or "Overall Function Check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

#### How to read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

(P) With CONSULT-II

With GST

Emission-related Diagnostic Information (Cont'd)

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc. These DTCs are prescribed by ISO 15031-6.

(CONSULT-II also displays the malfunctioning component or system.)

- 1st trip DTC No. is the same as DTC No.
- Output of a DTC indicates a malfunction. However, Mode II and GST do not indicate whether the
  malfunction is still occurring or has occurred in the past and has returned to normal.
  CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.

A sample of CONSULT-II display for DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.

If the DTC is being detected currently, the time data will be "0".

If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".

	SELF DIAG RESU	ILTS		SELF DIAG RESU	ILTS	
	DTC RESULTS	TIME		DTC RESULTS	TIME	
DTC	MAF SEN/CIRCUIT [P0100]	0	1st trip	MAF SEN/CIRCUIT [P0100]	1t	
display			DTC display			
						SEF992

### Freeze Frame Data and 1st Trip Freeze Frame Data

NFEC0031S0902

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-76.

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items				
1	Freeze frame data	Misfire — DTC: P0300 - P0306 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175			
2		Except the above items (Includes A/T related items)			
3	1st trip freeze frame d	ata			

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "How to Erase Emission-related Diagnostic Information". Refer to EC-57.

Emission-related Diagnostic Information (Cont'd)

# System Readiness Test (SRT) Code

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15051-5.

NFEC0031S0903

As part of an emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

#### NOTE:

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

### NOTE:

If MI is "ON" during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT") and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to "CMPLT".

SRT item (CONSULT-II indication)	Perfor- mance Pri- ority*1	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.
CATALYST	3	Three way catalyst function	P0420, P0430
HO2S	3	Heated oxygen sensor 1 (front) (circuit)	P0130, P0150
		Heated oxygen sensor 1 (front) (lean shift monitoring)	P0131, P0151
		Heated oxygen sensor 1 (front) (rich shift monitoring)	P0132, P0152
		Heated oxygen sensor 1 (front) (response monitoring)	P0133, P0153
		Heated oxygen sensor 1 (front) (high voltage)	P0134, P0154
		Heated oxygen sensor 2 (rear) (min. voltage monitoring)	P0137, P0157
		Heated oxygen sensor 2 (rear) (max. voltage monitoring)	P0138, P0158
		Heated oxygen sensor 2 (rear) (response monitoring)	P0139, P0159
		Heated oxygen sensor 2 (rear) (high voltage)	P0140, P0160
HO2S HTR	3	Heated oxygen sensor 1 heater (front)	P0135, P0155
		Heated oxygen sensor 2 heater (rear)	P0141, P0161
EGR SYSTEM	3	EGR function (close)	P0400
	1	EGR function (open)	P1402

<sup>\*1:</sup> If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

# **SRT Set Timing**

IFEC0031S090

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Emission-related Diagnostic Information (Cont'd)

				Example		
Self-diagn	Self-diagnosis result		← ON → OF		ion cycle OFF $\leftarrow$ ON $\rightarrow$	$OFF  \leftarrow ON \rightarrow$
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"CMPLT"	"CMPLT"	"CMPLT"	"CMPLT"
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"INCMP"	"INCMP"	"CMPLT"	"CMPLT"
NG exists	Case 3	P0400	OK	ОК	_	_
		P0402	_	_	_	_
		P1402	NG	_	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	_	1st trip DTC	DTC (= MI "ON")
		SRT of EGR	"INCMP"	"INCMP"	"INCMP"	"CMPLT"

OK: Self-diagnosis is carried out and the result is OK.

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT". → Case 1 above

When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result. → Case 2 above If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT". → Case 3 above

The table above shows that the minimum number of cycles for setting SRT as "INCMP" is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary of each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate "INCMP".

#### NOTE:

SRT can be set as "CMPLT" together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates "CMPLT".

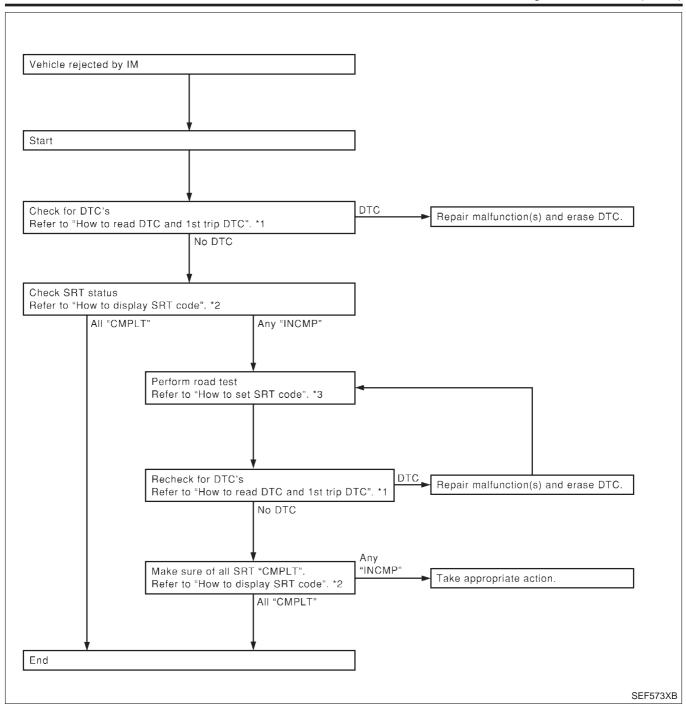
# **SRT Service Procedure**

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence on the next page.

NG: Self-diagnosis is carried out and the result is NG.

<sup>-:</sup> Self-diagnosis is not carried out.

Emission-related Diagnostic Information (Cont'd)



# **How to Display SRT Code**

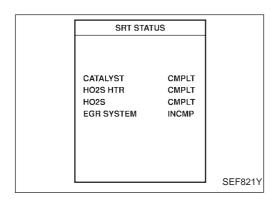
#### (P) With CONSULT-II

NFEC0031S0910

Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.

For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed as shown below.

Emission-related Diagnostic Information (Cont'd)



## With GST

Selecting Mode 1 with GST (Generic Scan Tool)

# How to Set SRT Code

NFEC0031S0911

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

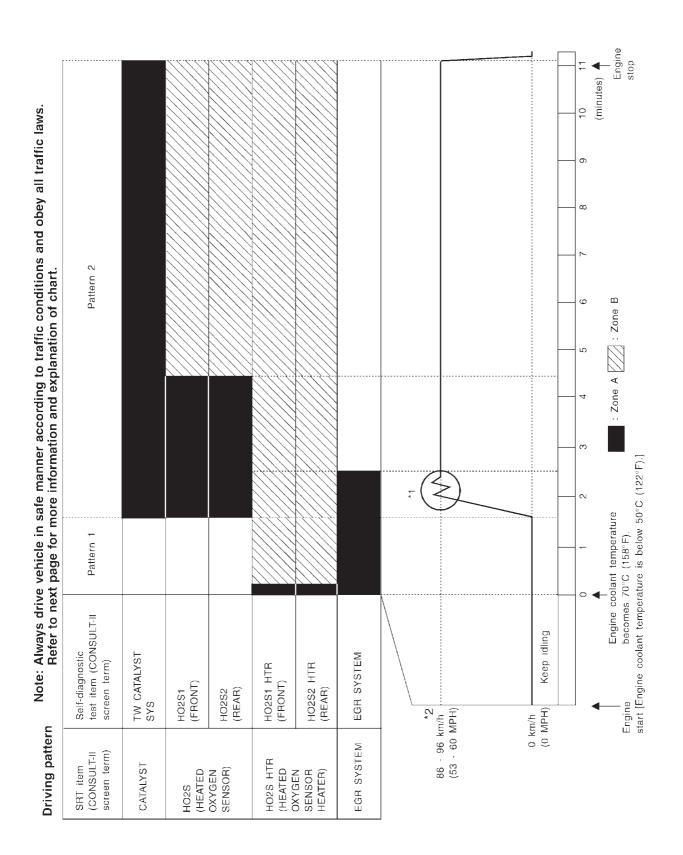
### (P) With CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on "Performance Priority" in the table on EC-47.

### **⋈** Without CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



#### Emission-related Diagnostic Information (Cont'd)

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  - Zone A refers to the range where the time required, for the diagnosis under normal conditions\*, is the shortest.
  - Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.
- \*: Normal conditions refer to the following:
- Sea level
- Flat road
- Ambient air temperature: 20 30°C (68 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
   Under different conditions [For example: ambient air temperature other than 20 30°C (68 86°F)], diagnosis may also be performed.

#### Pattern 1:

- The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals 70 and 58 is 3.0 - 4.3V).
- The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals 70 and 58 is lower than 1.4V).
- The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 92 and ground is less than 4.1V).

#### Pattern 2

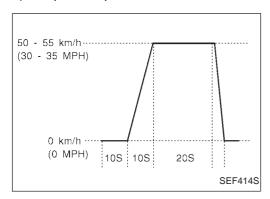
When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted.
 In this case, the time required for diagnosis may be extended.

#### Pattern 3:

• The driving pattern outlined in \*2 must be repeated at least 3 times.

#### Pattern 4:

- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.
- \*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
- \*2: Operate the vehicle in the following driving pattern.
- 1) Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
- 2) Repeat driving pattern shown below at least 10 times.
- During acceleration, hold the accelerator pedal as steady as possible.
- 3) Repeat steps 1 and 2 until the EGR system SRT is set.



\*3: Checking the vehicle speed with GST is advised.

## **Suggested Transmission Gear Position for A/T Models**

Set the selector lever in the "D" position with the overdrive switch turned ON.

Emission-related Diagnostic Information (Cont'd)

# Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

	For normal acceleration [less than 1,21	For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:	
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	km/h (MPH)
1st to 2nd	21 (13)	21 (13)	24 (15)
2nd to 3rd	37 (23)	26 (16)	40 (25)
3rd to 4th	53 (33)	44 (27)	64 (40)
4th to 5th	63 (39)	58 (36)	72 (45)

### Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.

Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits and drive according to the road conditions to ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

Gear	km/h (MPH)
1st	50 (30)
2nd	89 (55)
3rd	128 (80)
4th	_
5th	_

# Test Value and Test Limit (GST Only — not Applicable to CONSULT-II)

NFEC0031S0904

The following is the information specified in Mode 6 of ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is "OK" or "NG" while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

Items for which these data (test value and test limit) are displayed are the same as SRT code items (26 test items).

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

X: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application	
SKI Itelli	Sell-diagnostic test item	TID	CID	Test IIITIIL	Application	
CATALVET	Three way catalyst function (bank 1)		01H	Max.	X	
CATALYST	Three way catalyst function (bank 2)	03H	02H	Max.	Х	

Emission-related Diagnostic Information (Cont'd)

SRT item	Colf diagnostic test item	Test value (	GST display)		Amplication
SKIItem	Self-diagnostic test item	TID	CID	Test limit	Application
		09H	04H	Max.	Х
		0AH	84H	Min.	Х
	Heated oxygen sensor 1 (front) (bank 1)	0BH	04H	Max.	Х
	(Same 1)	0CH	04H	Max.	Х
		0DH	04H	Max.	Х
		11H	05H	Max.	Х
		12H	85H	Min.	Х
	Heated oxygen sensor 1 (front) (bank 2)	13H	05H	Max.	Х
O2 CENCOD		14H	05H	Max.	Х
O2 SENSOR		15H	05H	Max.	Х
		19H	86H	Min.	Х
	Heated oxygen sensor 2 (rear) (bank 1)	1AH	86H	Min.	Х
		1BH	06H	Max.	Х
		1CH	06H	Max.	Х
	Heated oxygen sensor 2 (rear) (bank 2)	21H	87H	Min.	Х
		22H	87H	Min.	Х
		23H	07H	Max.	X
		24H	07H	Max.	Х
	Heated oxygen sensor 1 heater (front)	29H	08H	Max.	Х
	(bank 1)	2AH	88H	Min.	Х
	Heated oxygen sensor 1 heater (front)	2BH	09H	Max.	Х
D2 SENSOR HEATER	(bank 2)	2CH	89H	Min.	X
DZ SENSON FILATEN	Heated oxygen sensor 2 heater (rear)	2DH	0AH	Max.	Х
	(bank 1)	2EH	8AH	Min.	Х
	Heated oxygen sensor 2 heater (rear)	2FH	0BH	Max.	Х
	(bank 2)	30H	8BH	Min.	Х
		31H	8CH	Min.	Х
		32H	8CH	Min.	Х
EGR SYSTEM	EGR function	33H	8CH	Min.	Х
		34H	8CH	Min.	Х
		35H	0CH	Max.	Х

Emission-related Diagnostic Information (Cont'd)

# **Emission-related Diagnostic Information Items**

X: Applicable —: Not applicable

				X: Applicable	—: Not applicable
Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	P0000	_	_	_	_
MAF SEN/CIRCUIT	P0100	_	_	X	EC-139
AIR TEMP SEN/CIRC	P0110	_	_	×	EC-146
COOLANT T SEN/CIRC	P0115	_	_	×	EC-151
THRTL POS SEN/CIRC	P0120	_	_	X	EC-156
HO2S1 (B1)	P0130	X	×	X*2	EC-165
HO2S1 (B1)	P0131	X	×	X*2	EC-175
HO2S1 (B1)	P0132	Х	X	X*2	EC-183
HO2S1 (B1)	P0133	X	X	X*2	EC-191
HO2S1 (B1)	P0134	Х	X	X*2	EC-204
HO2S1 HTR (B1)	P0135	Х	X	X*2	EC-212
HO2S2 (B1)	P0137	X	Х	X*2	EC-219
HO2S2 (B1)	P0138	Х	Х	X*2	EC-230
HO2S2 (B1)	P0139	Х	Х	X*2	EC-241
HO2S2 (B1)	P0140	X	Х	X*2	EC-252
HO2S2 HTR (B1)	P0141	Х	X	X*2	EC-261
HO2S1 (B2)	P0150	X	X	X*2	EC-165
HO2S1 (B2)	P0151	Х	X	X*2	EC-175
HO2S1 (B2)	P0152	Х	X	X*2	EC-183
HO2S1 (B2)	P0153	X	×	X*2	EC-191
HO2S1 (B2)	P0154	Х	X	X*2	EC-204
HO2S1 HTR (B2)	P0155	X	×	X*2	EC-212
HO2S2 (B2)	P0157	X	×	X*2	EC-219
HO2S2 (B2)	P0158	X	×	X*2	EC-230
HO2S2 (B2)	P0159	X	X	X*2	EC-241
HO2S2 (B2)	P0160	Х	X	X*2	EC-252
HO2S2 HTR (B2)	P0161	Х	X	X*2	EC-261
FUEL SYS-LEAN/BK1	P0171	_	_	Х	EC-268
FUEL SYS-RICH/BK1	P0172	_	_	Х	EC-276
FUEL SYS-LEAN/BK2	P0174	_	_	Х	EC-268
FUEL SYS-RICH/BK2	P0175	_	_	Х	EC-276
FUEL TEMP SEN/CIRC	P0180	_	_	Х	EC-283
MULTI CYL MISFIRE	P0300	_	_	Х	EC-288
CYL 1 MISFIRE	P0301	_	_	Х	EC-288
		:	:	:	

Emission-related Diagnostic Information (Cont'd)

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
CYL 2 MISFIRE	P0302	_	_	X	EC-288
CYL 3 MISFIRE	P0303	_	_	Х	EC-288
CYL 4 MISFIRE	P0304	_	_	Х	EC-288
CYL 5 MISFIRE	P0305	_	_	X	EC-288
CYL 6 MISFIRE	P0306	_	_	X	EC-288
KNOCK SEN/CIRC-B1	P0325	_	_	_	EC-296
CPS/CIRCUIT (POS)	P0335	_	_	Х	EC-302
CAM PS/CIRC (PHS)	P0340	_	_	Х	EC-310
EGR SYSTEM	P0400	Х	X	X*2	EC-316
EGR VOL CONT/V CIR	P0403	_	_	Х	EC-325
TW CATALYST SYS-B1	P0420	Х	X	X*2	EC-332
TW CATALYST SYS-B2	P0430	Х	X	X*2	EC-332
PURG VOLUME CONT/V	P0443	_	_	Х	EC-337
VEH SPEED SEN/CIRC	P0500	_	_	Х	EC-343
IACV/AAC VLV/CIRC	P0505	_	_	Х	EC-347
CLOSED TP SW/CIRC	P0510	_	_	Х	EC-356
ECM	P0605	_	_	Х	EC-365
PNP SW/CIRC	P0705	_	_	Х	AT-124
ATF TEMP SEN/CIRC	P0710	_	_	Х	AT-130
VEH SPD SEN/CIR AT	P0720	_	_	Х	AT-136
ENGINE SPEED SIG	P0725	_	_	Х	AT-141
A/T 1ST GR FNCTN	P0731	_	_	Х	AT-146
A/T 2ND GR FNCTN	P0732	_	_	Х	AT-152
A/T 3RD GR FNCTN	P0733	_	_	Х	AT-158
A/T 4TH GR FNCTN	P0734	_	_	Х	AT-164
TCC SOLENOID/CIRC	P0740	_	_	Х	AT-173
L/PRESS SOL/CIRC	P0745	_	_	Х	AT-178
SFT SOL A/CIRC	P0750	_	_	Х	AT-184
SFT SOL B/CIRC	P0755	_	_	Х	AT-189
SWIRL CONT SOL/V	P1131	_	_	Х	EC-368
ENG OVER TEMP	P1217	_	_	Х	EC-375
CPS/CIRCUIT (REF)	P1335	_	_	Х	EC-402
CPS/CIRC (POS) COG	P1336	_	_	Х	EC-409
EGR TEMP SEN/CIRC	P1401	_	_	Х	EC-417
EGR SYSTEM	P1402	Х	X	X*2	EC-425
A/T DIAG COMM LINE	P1605	_	_	Х	EC-434
TP SEN/CIRC A/T	P1705	_	_	Х	AT-194

Emission-related Diagnostic Information (Cont'd)

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
P-N POS SW/CIRCUIT	P1706	_	_	X	EC-437
O/R CLTCH SOL/CIRC	P1760	_	_	Х	AT-203

<sup>\*1: 1</sup>st trip DTC No. is the same as DTC No.

#### NOTE:

Regarding A33 models, "-B1" and "BK1" indicate bank 1 and "-B2" and "BK2" indicate bank 2.

# How to Erase Emission-related Diagnostic Information How to Erase DTC ( With CONSULT-II)

NFEC0031S0906

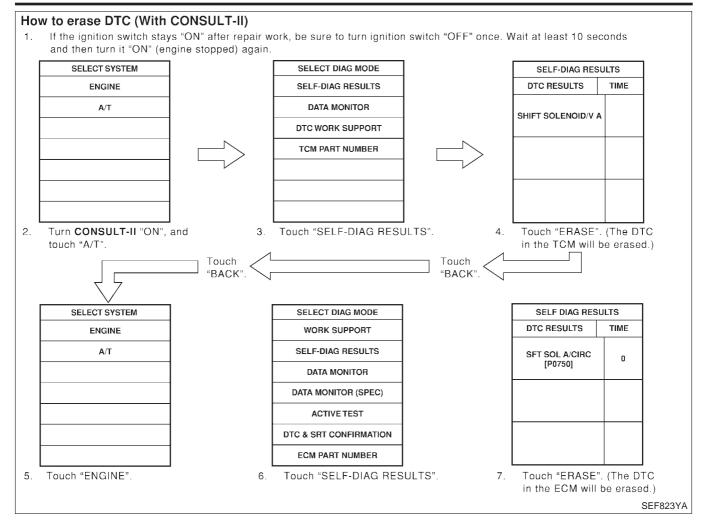
#### NOTE:

## If the DTC is not for A/T related items (see EC-7), skip steps 2 through 4.

- 1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
- 2) Turn CONSULT-II "ON" and touch "A/T".
- 3) Touch "SELF-DIAG RESULTS".
- 4) Touch "ERASE". [The DTC in the TCM (Transmission control module) will be erased.] Then touch "BACK" twice.
- 5) Touch "ENGINE".
- 6) Touch "SELF-DIAG RESULTS".
- 7) Touch "ERASE". (The DTC in the ECM will be erased.)
- If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

<sup>\*2:</sup> These are not displayed with GST.

Emission-related Diagnostic Information (Cont'd)



The emission related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT-II.

**How to Erase DTC ( With GST)** 

#### NOTE:

### If the DTC is not for A/T related items (see EC-7), skip step 2.

- 1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
- 2) Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
- 3) Select Mode 4 with GST (Generic Scan Tool).

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

- If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.
- The following data are cleared when the ECM memory is erased.
- 1) Diagnostic trouble codes
- 2) 1st trip diagnostic trouble codes
- 3) Freeze frame data
- 4) 1st trip freeze frame data
- 5) System readiness test (SRT) codes
- 6) Test values
- 7) Distance traveled while MI is activated
- 8) Others

Emission-related Diagnostic Information (Cont'd)

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

# MODELS WITHOUT EURO-OBD SYSTEM DTC and 1st Trip DTC

NFEC0031S10

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory. In other words, the DTC is stored in the ECM memory when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For fail-safe items, the DTC is stored in the ECM memory even in the 1st trip.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "How to Erase Emission-related Diagnostic Information", EC-60

When a (1st trip) DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to EC-90. Then perform "DTC Confirmation Procedure" or "Overall Function Check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

# How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

# **⋈** Without CONSULT-II

ECM displays the DTC by a set of four digit numbers with MI illumination in the diagnostic test mode II (Self-diagnostic results). Example: 0100, 0115, 0340, 1335, etc.

#### (P) With CONSULT-II

CONSULT-II displays the DTC in "SELF-DIAG RESULTS" mode. Examples: P0100, P0115, P0340, P1335, etc.

(CONSULT-II also displays the malfunctioning component or system.)

- 1st trip DTC No. is the same as DTC No.
- Output of a DTC indicates a malfunction. However, ECM in the diagnostic test mode II (Self-diagnostic results) does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, the use of CONSULT-II (if available) is recommended.

A sample CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in the SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.

If the DTC is being detected currently, the time data will be "0".

If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".

	SELF DIAG RESU	JLTS TIME		SELF DIAG RESU	ILTS TIME	
DTC	MAF SEN/CIRCUIT [P0100]	0	1st trip	MAF SEN/CIRCUIT [P0100]	1t	
display			DTC display			
						SEF9

# Freeze Frame Data and 1st Trip Freeze Frame Data

NFEC0031S1002

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, throttle valve opening, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II. For details, see EC-76.

Emission-related Diagnostic Information (Cont'd)

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM.

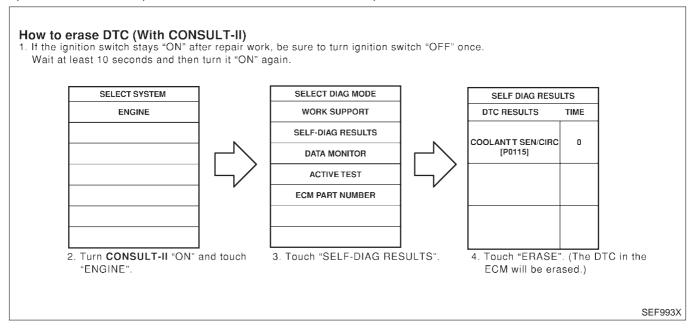
If freeze frame data is stored in the ECM memory and another freeze frame data occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "How to Erase Emission-related Diagnostic Information", EC-60.

# How to Erase Emission-related Diagnostic Information How to Erase DTC ( With CONSULT-II)

NFEC0031S1003

- 1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
- 2) Touch "ENGINE".
- 3) Touch "SELF-DIAG RESULTS".
- 4) Touch "ERASE". (The DTC in the ECM will be erased.)



The emission related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT-II.

# How to Erase DTC (இ Without CONSULT-II)

- 1) If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
- 2) Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-63.)

The emission related diagnostic information in the ECM can be erased by changing the diagnostic test mode.

- If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.
- Erasing the emission-related diagnostic information using CONSULT-II is easier and quicker than switching the diagnostic test mode using the data link connector.
- The following data are cleared when the ECM memory is erased.
- 1) Diagnostic trouble codes
- 2) 1st trip diagnostic trouble codes
- 3) Freeze frame data
- 4) 1st trip freeze frame data
- 5) Others

NVIS (Nissan Vehicle Immobilizer System — NATS)

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

# NVIS (Nissan Vehicle Immobilizer System — NATS)

NFEC0649

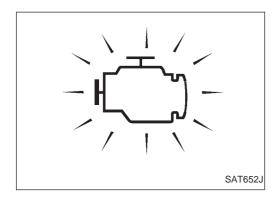
		I
SELF DIAG RESU	LTS	
DTC RESULTS	TIME	
NATS MALFUNCTION [P1610]	0	
		SEF515Y

- If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNC-TION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to "NVIS (Nissan Vehicle Immobilizer System NATS)" in EL section.
- Confirm no self-diagnostic results of NVIS (NATS) is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.
- When replacing ECM, initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs must be carried out with CONSULT-II using NATS program card.
   Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NVIS (NATS) initialization and NVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, IVIS/NVIS.

# **Malfunction Indicator (MI)**

# **DESCRIPTION**

NFEC0032



The MI is located on the instrument panel.

- 1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the MI does not light up, refer to EL-145, WARNING LAMPS or see EC-608.
- 2. When the engine is started, the MI should go off. If the MI remains on, the ECM's CPU is malfunctioning.

Malfunction Indicator (MI) (Cont'd)

# On Board Diagnostic System Function

The on board diagnostic system has the following four functions.

=NFEC0032S01

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped		This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit. (See EC-608.)
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When the ECM's CPU is malfunctioning, the MI will light up to inform the driver that a malfunction has been detected.
Mode II	II Ignition switch in ON position  Engine stopped		This function allows DTCs and 1st trip DTCs to be read.
	Engine running	HEATED OXYGEN SENSOR 1 MONITOR (FRONT)	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1 (front), to be read.

# **MI Flashing without DTC**

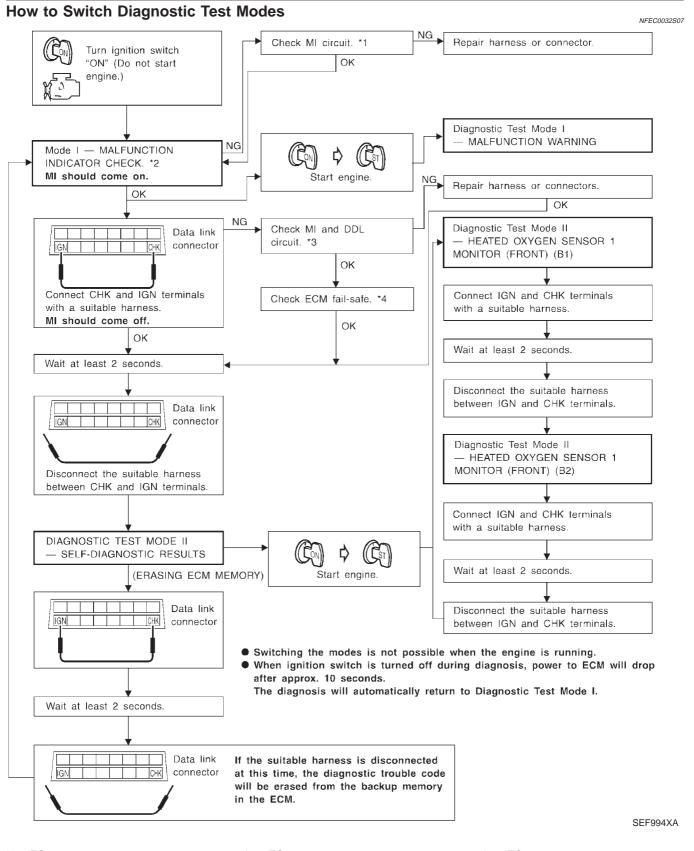
If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode following "How to Switch Diagnostic Test Modes", EC-63.

How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-64.)

The following emission-related diagnostic information is cleared when the ECM memory is erased.

- 1) Diagnostic trouble codes
- 2) 1st trip diagnostic trouble codes
- 3) Freeze frame data
- 4) 1st trip freeze frame data
- 5) System readiness test (SRT) code
- 6) Test values
- 7) Distance traveled while MI is activated
- 8) Others

Malfunction Indicator (MI) (Cont'd)



\*1 EC-608

\*3 EC-608

\*4 EC-109

\*2 EC-62

Malfunction Indicator (MI) (Cont'd)

## Diagnostic Test Mode I — Bulb Check

FEC0032S0

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-145, "WARNING LAMPS" or see EC-608.

# Diagnostic Test Mode I — Malfunction Warning

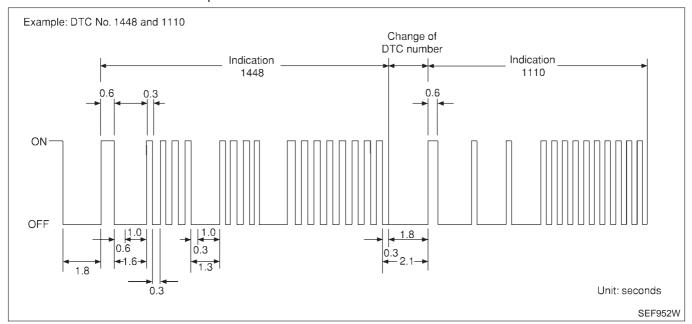
NFEC0032S04

MI	Condition	
ON	When the ECM's CPU is malfunctioning.	
OFF	No malfunction.	

# Diagnostic Test Mode II — Self-diagnostic Results

NFEC0032S08

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI. A DTC will be used as an example for how to read a code.



A particular DTC can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The length of time the 1000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second)-OFF (0.6-second) cycle.

The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle. A change from one digit numeral to another occurs at an interval of 1.0 second OFF. In other words, the latter numeral appears on the display 1.3 seconds after the former numeral has disappeared.

A change from one DTC to another occurs at an interval of 1.8 second off.

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0000" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-7.)

# How to Erase Diagnostic Test Mode II (Self-diagnostic results)

NFEC0032S080

The DTC can be erased from the backup memory in the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "How to Switch Diagnostic Test Modes", EC-63.)

- If the battery is disconnected, the DTC will be lost from the backup memory after approx. 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

Malfunction Indicator (MI) (Cont'd)

# Diagnostic Test Mode II — Heated Oxygen Sensor 1 Monitor (front)

=NFEC0032S09

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1 (front).

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition	
ON	Lean	Closed loop system	
OFF	Rich	- Closed loop system	
*Remains ON or OFF	Any condition	Open loop system	

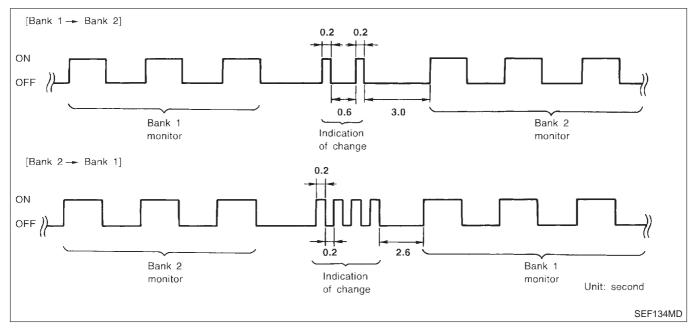
<sup>\*:</sup> Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 (front) function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.

Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load. ECM will start heated oxygen sensor 1 (front) (B1) monitoring.

#### How to Switch Monitored Sensor from Bank 1 to Bank 2 or Vice Versa

- The following procedure should be performed while the engine is running.
- 1. Connect CHK and IGN terminals of data link connector with a suitable harness.
- 2. Wait at least 2 seconds.
- 3. Disconnect the suitable harness between CHK and IGN terminals of data link connector.



# **OBD System Operation Chart (Models with Euro-OBD System)**

# RELATIONSHIP BETWEEN MI, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

NFEC0650

NFEC0032S0901

 When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.

- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MI will come on. For details, refer to "Two Trip Detection Logic" on EC-44.
- The MI will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS"

OBD System Operation Chart (Models with Euro-OBD System) (Cont'd)

mode of CONSULT-II will count the number of times the vehicle is driven.

• The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

# **SUMMARY CHART**

NEECOGEOGO

Items	Fuel Injection System	Misfire	Other	
MI (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)	
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)	
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)	
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)	

For details about patterns "B" and "C" under "Fuel Injection System" and "Misfire", see EC-68.

For details about patterns "A" and "B" under "Other", see EC-70.

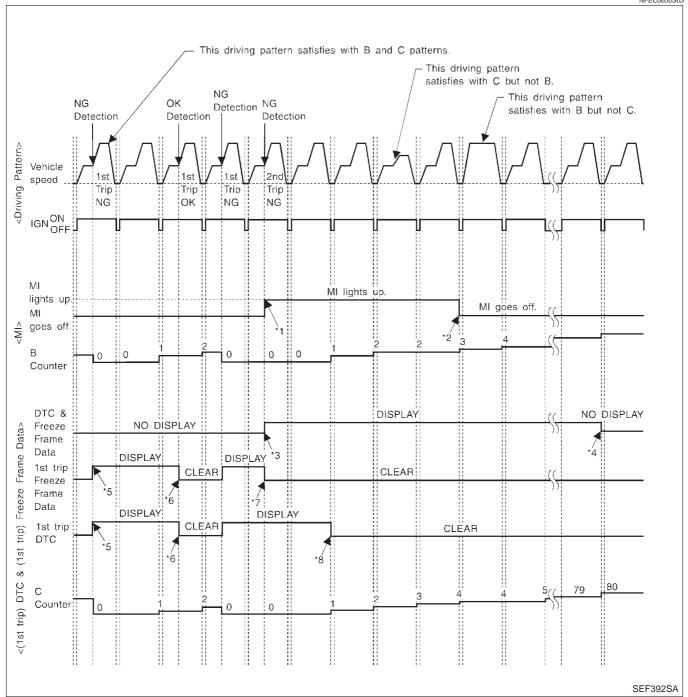
<sup>\*1:</sup> Clear timing is at the moment OK is detected.

<sup>\*2:</sup> Clear timing is when the same malfunction is detected in the 2nd trip.

OBD System Operation Chart (Models with Euro-OBD System) (Cont'd)

# RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"

NFEC0650S03



- \*1: When the same malfunction is detected in two consecutive trips, MI will light up.
- \*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- \*4: The DTC and the freeze frame
- data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction.
- (The DTC and the freeze frame data still remain in ECM.)
- \*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- \*6: The 1st trip DTC and the 1st trip

- freeze frame data will be cleared at the moment OK is detected.
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.
- \*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

OBD System Operation Chart (Models with Euro-OBD System) (Cont'd)

# EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

# **Driving Pattern B**

NFEC0650S0401

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MI will go off when the B counter reaches 3. (\*2 in EC-67)

# **Driving Pattern C**

NFEC0650S0402

Driving pattern C means the vehicle operation as follows:

- 1) The following conditions should be satisfied at the same time: Engine speed: (Engine speed in the freeze frame data)  $\pm 375$  rpm Calculated load value: (Calculated load value in the freeze frame data)  $\times$  (1 $\pm$ 0.1) [%] Engine coolant temperature (T) condition:
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

#### Example:

If the stored freeze frame data is as follows:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of driving pattern C.
- The C counter will be counted up when driving pattern C is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

OBD System Operation Chart (Models with Euro-OBD System) (Cont'd)

# RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

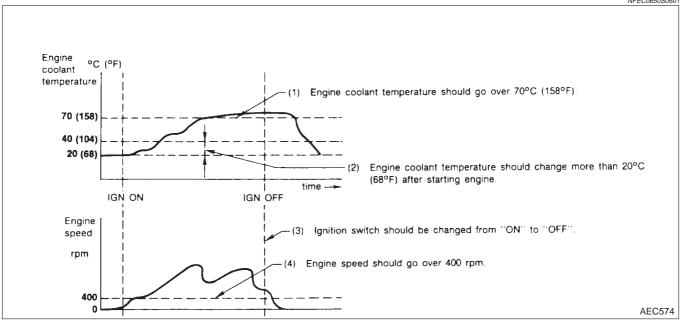
NFEC0650S05 This driving pattern satisfies with A and B patterns. This driving pattern satisfies with A but not B. NG This driving pattern NG Detection Detection NG satisfies with B but not A. Detection Detection <Driving Pattern> Vehicle 2nc speed Trip Trip Trip Trip OK NG NG NG IGN OFF MI lights up. lights up goes off. 2 MI 2 MI goes off \*2 Ġ В 0 0 0 0 Counter DTC & NO DISPLAY DISPLAY Freeze NO DISPLAY DTC & (1st trip) Freeze Frame Data> Frame Data DİSPLAY DISPLAY 4 CLEAR 1st trip **CLEAR** Freeze 5 Frame Data DİSPLAY DISPLÄY CLEAR CLEAR 1st trip DTC 3 \*6 40 30 2 Counter 0 trip) <(1st SEF393SA

- \*1: When the same malfunction is detected in two consecutive trips, MI will light up.
- \*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction.
  - (The DTC and the freeze frame data still remain in ECM.)
- \*5: When a malfunction is detected for the first time, the 1st trip DTC
- and the 1st trip freeze frame data will be stored in ECM.
- \*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

OBD System Operation Chart (Models with Euro-OBD System) (Cont'd)

# EXPLANATION FOR DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

Driving Pattern A



- The A counter will be cleared when the malfunction is detected regardless of (1) (4).
- The A counter will be counted up when (1) (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

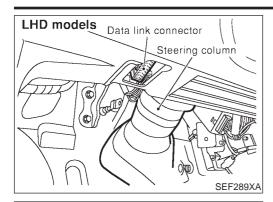
# **Driving Pattern B**

NFEC0650S0602

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MI will go off when the B counter reaches 3 (\*2 in EC-69).



# **CONSULT-II**

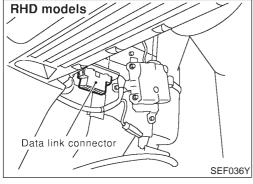
# **CONSULT-II INSPECTION PROCEDURE**

=NFEC0034

NFEC0034S01

1. Turn ignition switch OFF.

2. Connect CONSULT-II to data link connector, which is located under drivers side dash panel.



- 3. Turn ignition switch ON.
- 4. Touch "START".

NISSAN  CONSULT-II	
START	
SUB MODE	
	PBR455D

5. Touch "ENGINE".

SELECT SYSTEM	]
ENGINE	
	1
	1
	1
	1
	-
	]
	SEF995X

 Perform each diagnostic test mode according to each service procedure.
 For further information, see the CONSULT-II Operation Manual.

SELECT DIAG MODE
WORK SUPPORT
SELF-DIAG RESULTS
DATA MONITOR
DATA MONITOR (SPEC)
ACTIVE TEST
DTC & SRT CONFIRMATION
ECM PART NUMBER
SEF824Y

CONSULT-II (Cont'd)

# ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Models with Euro-OBD System

NFEC0034S02 NFEC0034S0201

			DIAGNOSTIC TEST MODE							
			SELF-DIAGNOSTIC RESULTS		DATA MONI- TOR	DATA MONI- TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION		
Item		WORK SUP- PORT	DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP- PORT	
	INPUT	Crankshaft position sensor (POS)		Х	Х	Х	Х			
		Crankshaft position sensor (REF)		Х		Х	Х			
		Mass air flow sensor		Х		Х	Х			
		Engine coolant temperature sensor		Х	Х	Х	х	Х		
		Heated oxygen sensor 1 (front)		Х		X	Х		Х	X
		Heated oxygen sensor 2 (rear)		Х		Х	Х		X	Х
တ		Vehicle speed sensor		X	Х	X	X			
ENGINE CONTROL COMPONENT PARTS		Throttle position sensor		X		X	Х			
Ä		Fuel tank temperature sensor		X		X	Х			
NO NO		Absolute pressure sensor				X	X			
MP		EGR temperature sensor		X		X	Х			
S		Intake air temperature sensor		X		X	X			
TRO		Knock sensor		Х						
S		Ignition switch (start signal)				X	Х			
빌		Closed throttle position switch		Х		Х	Х			
ENG		Closed throttle position switch (throttle position sensor signal)				X	X			
		Air conditioner switch				X	Х			
		Park/neutral position (PNP) switch		Х		Х	X			
		Power steering oil pressure switch				Х	х			
		Battery voltage				Х	Х	_		
		Ambient air temperature switch				Х	Х	_		
		Load signal				Х	Х			

			DIAGNOSTIC TEST MODE						
			SELF-DIAGNOSTIC RESULTS		DATA	DATA		DTC & SRT CONFIRMATION	
Item		WORK SUP- PORT	DTC*1	FREEZE FRAME DATA*2	MONI- TOR	MONI- TOR (SPEC)	ACTIVE TEST	SRT STATUS	DTC WORK SUP- PORT
	Injectors				Х	Х	Х		
	Power transistor (Ignition timing)				Х	Х	Х		
	IACV-AAC valve		Х		Х	Х	Х		
ARTS	EVAP canister purge volume control solenoid valve		Х		Х	Х	Х		Х
<u> </u>	Air conditioner relay				Х	Х			
NE	Fuel pump relay	Х			Х	Х	Х		
MP 5	Cooling fan		Х		Х	Х	Х		
OL COM	EGR volume control valve		Х		Х	Х	Х		
ONTRO	Heated oxygen sensor 1 heater (front)		Х		Х	Х		Х	
ENGINE CONTROL COMPONENT PARTS OUTPUT	Heated oxygen sensor 2 heater (rear)		Х		Х	Х		Х	
ENG	Swirl control valve control sole- noid valve		Х		Х	Х	Х		
	Electronic controlled engine mount				Х	Х	х		
	Calculated load value			Х	Х	Х			

X: Applicable

<sup>\*1:</sup> This item includes 1st trip DTCs.

<sup>\*2:</sup> This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-46.

#### **Models without Euro-OBD System** NFEC0034S0202 **DIAGNOSTIC TEST MODE SELF-DIAGNOSTIC RESULTS DATA** Item **ACTIVE** WORK **DATA MONITOR FREEZE SUPPORT MONITOR TEST** (SPEC) DTC\*1 FRAME DATA\*2 Crankshaft position sensor (POS) Χ Χ Χ Χ Χ Χ Χ Χ Crankshaft position sensor (REF) Mass air flow sensor Χ Χ Χ Engine coolant temperature sensor Χ Χ Χ Χ Χ Χ Χ Χ Heated oxygen sensor 1 (front) Heated oxygen sensor 2 (rear) Χ Χ ENGINE CONTROL COMPONENT PARTS Χ Vehicle speed sensor Χ Χ Χ Χ Throttle position sensor Χ Χ Fuel tank temperature sensor Χ Χ Absolute pressure sensor Χ Χ Χ Χ EGR temperature sensor Χ Χ Χ Intake air temperature sensor Knock sensor Χ Ignition switch (start signal) Χ Χ Closed throttle position switch (throttle Χ Χ position sensor signal) Air conditioner switch Χ Χ Park/neutral position (PNP) switch Χ Χ Power steering oil pressure switch Χ Χ Battery voltage Χ Χ Ambient air temperature switch Χ Χ Load signal Χ Χ

			DIAGNOSTIC TEST MODE						
Item			WORK		GNOSTIC ULTS	DATA	DATA	ACTIVE TEST	
				DTC*1	FREEZE FRAME DATA*2	MONITOR	MONITOR (SPEC)		
		Injectors				X	Х	Х	
		Power transistor (Ignition timing)		X (Ignition signal)		Х	X	Х	
RTS		IACV-AAC valve				Х	Х	Х	
CONTROL COMPONENT PARTS		EVAP canister purge volume control solenoid valve				X	Х	Х	
ONE		Air conditioner relay				Х	Х		
OMP	Ď	Fuel pump relay	Х			Х	Х	X	
)L C	DUTPUT	Cooling fan		Х		Х	Х	X	
YT RO		EGR volume control valve				Х	Х	X	
00		Heated oxygen sensor 1 heater (front)				Х	Х		
ENGINE		Heated oxygen sensor 2 heater (rear)				Х	Х		
ENG		Swirl control valve control solenoid valve				Х	Х	X	
		VIAS control solenoid valve				Х	Х	Х	
		Electronic controlled engine mount				Х	Х	Х	
		Calculated load value			Х	Х	Х		

X: Applicable

#### **FUNCTION**

NFEC0034S0

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (spec)	Input/Output specifications of the basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
DTC confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part numbers can be read.

<sup>\*1</sup> The following emission-related diagnostic information is cleared when the ECM memory is erased.

- 1) Diagnostic trouble codes
- 2) 1st trip diagnostic trouble codes
- 3) Freeze frame data
- 4) 1st trip freeze frame data
- 5) System readiness test (SRT) codes

<sup>\*1:</sup> This item includes 1st trip DTCs.

<sup>\*2:</sup> This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-59.

#### CONSULT-II (Cont'd)

- 6) Test values
- 7) Distance traveled while MI is activated.
- Others

#### **WORK SUPPORT MODE**

NFEC0034S04

WORK ITEM	CONDITION	USAGE
TP SW/TP SEN IDLE POSI ADJ	FOLLOW THE BASIC INSPECTION INSTRUCTION IN THE SERVICE MANUAL.	When adjusting the idle throttle position
FUEL PRESSURE RELEASE	FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clear the coefficient of self-learnign control value
TARGET IDLE RPM ADJ*	IDLE CONDITION	When setting target idle speed
TARGET IGNITION TIMING ADJ*	• IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.  If once the "TARGET IDLE RPM ADJ" has been done, the Idle Air Volume Learning procedure will not be completed.

<sup>\*:</sup> This function is not necessary in the usual service procedure.

#### **SELF-DIAGNOSTIC MODE DTC and 1st Trip DTC**

NFEC0034S05

Regarding items of "DTC and 1st trip DTC", refer to "TROUBLE DIAGNOSIS — INDEX" (See EC-7.)

# Freeze Frame Data and 1st Trip Freeze Frame Data

	NFEC003450502
Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	The engine control component part/control system has a trouble code, it is displayed as "PXXXX". (Refer to "TROUBLE DIAGNOSIS — INDEX", EC-7.)
FUEL SYS-B1*2	<ul> <li>"Fuel injection system status" at the moment a malfunction is detected is displayed.</li> <li>One mode in the following is displayed.</li> <li>"MODE 2": Open loop due to detected system malfunction</li> </ul>
FUEL SYS-B2*2	"MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	The engine coolant temperature at the moment a malfunction is detected is displayed.
S-FUEL TRIM-B1 [%]	"Short-term fuel trim" at the moment a malfunction is detected is displayed.  The chart term fuel trim indicates displayed and the chart term and the chart term is at the base first.
S-FUEL TRIM-B2 [%]	The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
L-FUEL TRIM-B1 [%]	"Long-term fuel trim" at the moment a malfunction is detected is displayed.  The long term fuel trim indicates much more gradual feedback company estimates to the base fuel calculation.
L-FUEL TRIM-B2 [%]	The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.

Freeze frame data item*1	Description
ENGINE SPEED [rpm]	The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH-P/S [%] or [degree]	The throttle valve opening at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	The intake air temperature at the moment a malfunction is detected is displayed.

<sup>\*1:</sup> The items are the same as those of 1st trip freeze frame data.

<sup>\*2:</sup> Regarding A33 model, "-B1" indicates bank 1 and "-B2" indicates bank 2.

			DATA MONITOR MODE	=NFEC0034S06
Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	0	0	Indicates the engine speed computed from the REF signal (120° signal) of the crankshaft position sensor (REF).	
CKPS·RPM (POS) [rpm]	0		Indicates the engine speed computed from the POS signal (1° signal) of the crankshaft position sensor (POS).	<ul> <li>Accuracy becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul>
POS COUNT	0		Indicates the number of signal plate (Flywheel/Drive Plate) cogs (tooth) during one revolution of the engine.	
MAS A/F SE-B1 [V]	0	0	The signal voltage of the mass air flow sensor is displayed.	When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	0	0	The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sen- sor) is displayed.	When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	0	0	The signal voltage of the heated oxy-	
HO2S1 (B2) [V]	0	0	gen sensor 1 (front) is displayed.	
HO2S2 (B1) [V]	0	0	The signal voltage of the heated oxy-	
HO2S2 (B2) [V]	0	0	gen sensor 2 (rear) is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	0		Display of heated oxygen sensor 1     (front) signal during air-fuel ratio feed-back control:     RICH means the mixture became	After turning ON the ignition switch,     "RICH" is displayed until air-fuel mix- ture ratio feedback control begins.
HO2S1 MNTR (B2) [RICH/LEAN]	0		"rich", and control is being affected toward a leaner mixture.  LEAN means the mixture became "lean", and control is being affected toward a rich mixture.	When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	0		Display of heated oxygen sensor 2 (rear) signal:     RICH means the amount of oxygen after three way catalyst is relatively	When the engine is stopped, a certain
HO2S2 MNTR (B2) [RICH/LEAN]	0		small.  LEAN means the amount of oxygen after three way catalyst is relatively large.	value is indicated.
VHCL SPEED SE [km/h] or [mph]	0	0	The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	0	0	The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	0	0	The throttle position sensor signal voltage is displayed.	
FUEL T/TMP SE [°C] or [°F]	0		The fuel temperature judged from the fuel tank temperature sensor signal voltage is displayed.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
INT/A TEMP SE [°C] or [°F]	0	0	The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	
EGR TEMP SEN [V]	0	0	The signal voltage of the EGR temperature sensor is displayed.	
START SIGNAL [ON/OFF]	0	0	Indicates [ON/OFF] condition from the starter signal.	After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/P SW [ON/OFF]			Indicates mechanical contact     [ON/OFF] condition of the closed throttle position switch.	
CLSD THL POS [ON/OFF]	0	0	Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal.	
AIR COND SIG [ON/OFF]	0	0	Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	0	0	Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	0	0	[ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated.	
AMB TEMP SW [ON/OFF]	0		Indicates [ON/OFF] condition from the ambient air temperature switch signal.	
IGNITION SW [ON/OFF]	0		Indicates [ON/OFF] condition from ignition switch.	
INJ PULSE-B1 [msec]		0	Indicates the actual fuel injection pulse	When the engine is stopped, a certain
INJ PULSE-B2 [msec]			width compensated by ECM according to the input signals.	computed value is indicated.
B/FUEL SCHDL [msec]		0	"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
IGN TIMING [BTDC]		0	Indicates the ignition timing computed by ECM according to the input signals.	When the engine is stopped, a certain value is indicated.
IACV-AAC/V [step]		0	Indicates the IACV-AAC valve control value computed by ECM according to the input signals.	
PURG VOL C/V [%]			<ul> <li>Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
A/F ALPHA-B1 [%]		0	The mean value of the air-fuel ratio feedback correction factor per cycle is	When the engine is stopped, a certain value is indicated.
A/F ALPHA-B2 [%]		0	indicated.	<ul> <li>This data also includes the data for the air-fuel ratio learning control.</li> </ul>

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
AIR COND RLY [ON/OFF]		0	The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
FUEL PUMP RLY [ON/OFF]			Indicates the fuel pump relay control condition determined by ECM accord- ing to the input signals.	
COOLING FAN [ON/OFF]			Indicates the control condition of the cooling fan (determined by ECM according to the input signal).     HIGH High speed operation LOW Low speed operation OFF Stop	
EGR VOL CON/V [step]		0	<ul> <li>Indicates the EGR volume control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
HO2S1 HTR (B1) [ON/OFF]			Indicates [ON/OFF] condition of heated oxygen sensor 1 heater (front) determined by ECM according to the	
HO2S1 HTR (B2) [ON/OFF]			input signals.	
HO2S2 HTR (B1) [ON/OFF]			Indicates [ON/OFF] condition of heated oxygen sensor 2 heater (rear)	
HO2S2 HTR (B2) [ON/OFF]			determined by ECM according to the input signals.	
CAL/LD VALUE [%]			"Calculated load value" indicates the value of the current airflow divided by peak airflow.	
ABSOL TH-P/S [%]			"Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.	
MASS AIRFLOW [g·m/s]			Indicates the mass airflow computed by ECM according to the signal volt- age of the mass airflow sensor.	
ABSOL PRES/SE [V]	0		The signal voltage of the absolute pressure sensor is displayed.	
SWRL CONT S/V [ON/OFF]			<ul> <li>The control condition of the swirl control valve control solenoid valve (determined by ECM according to the input signals) is indicated.</li> <li>ON Swirl control valve is closed. OFF Swirl control valve is opened.</li> </ul>	
LOAD SIGNAL [ON/OFF]	0	0	Indicates [ON/OFF] condition from the electrical load signal and/or lighting switch.     ON rear defogger is operating and/or lighting switch is on.     OFF rear defogger is not operating and lighting switch is not on.	
TRVL AFTER MIL [km] or [Mile]			Distance traveled while MI is activated	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FPCM DR VOLT [V]			This item is not available. A certain value is indicated.	
VIAS S/V [ON/OFF]			<ul> <li>The control condition of the VIAS control solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>OFF VIAS control solenoid valve is not operating.</li> <li>ON VIAS control solenoid valve is operating.</li> </ul>	
ENGINE MOUNT [IDLE/TRVL]			The control condition of the electronic controlled engine mount (computed by ECM according to the input signals) is indicated.  IDLE Idle condition TRVL Driving condition	
IDL A/V LEAN			Display the condition of idle air volume learning     YET Idle air volume learning has not been performed yet.     CMPLT Idle air volume learning has already been performed successfully.     INCMP Idle air volume learning has not been performed successfully.	
Voltage [V]			Voltage measured by the voltage probe.	
Frequenty [msec] or [Hz] or [%]			Pulse width, frequency or duty cycle measured by the pulse probe.	<ul> <li>Only "#" is displayed if item is unable to be measured.</li> <li>Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.</li> </ul>

#### NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding A33 model, "-B1" indicates bank 1 and "-B2" indicates bank 2.

#### DATA MONITOR (SPEC) MODE

NFEC0034S11

	NFECUU34:						
Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks			
MAS A/F SE-B1 [V]	0	0	The signal voltage of the mass air flow sensor specification is displayed.	When the engine is running, specification range is indicated.			
B/FUEL SCHDL [msec]			"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	When the engine is running, specification range is indicated.			
A/F ALPHA-B1 [%]		0	Indicates the mean value of the air-fuel	When the engine is running, specification range is indicated.			
A/F ALPHA-B2 [%]		0	ratio feedback correction factor per cycle.	This data also includes the data for the air-fuel ratio learning control.			

#### NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding A33 model, "B1" indicates bank 1 and "B2" indicates bank 2.

	ACTIVE TEST MODE  NFEC0034S07									
TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)							
FUEL INJECTION	<ul> <li>Engine: Return to the original trouble condition</li> <li>Change the amount of fuel injection using CONSULT-II.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	<ul> <li>Harness and connector</li> <li>Fuel injectors</li> <li>Heated oxygen sensor 1 (front)</li> </ul>							
IACV-AAC/V OPENING	<ul> <li>Engine: After warming up, idle the engine.</li> <li>Change the IACV-AAC valve opening percent using CON- SULT-II.</li> </ul>	Engine speed changes according to the opening percent.	<ul><li>Harness and connector</li><li>IACV-AAC valve</li></ul>							
ENG COOLANT TEMP	<ul> <li>Engine: Return to the original trouble condition</li> <li>Change the engine coolant tem- perature using CONSULT-II.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	<ul> <li>Harness and connector</li> <li>Engine coolant temperature sensor</li> <li>Fuel injectors</li> </ul>							
IGNITION TIMING	<ul> <li>Engine: Return to the original trouble condition</li> <li>Timing light: Set</li> <li>Retard the ignition timing using CONSULT-II.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	Adjust initial ignition timing							
POWER BAL- ANCE	<ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch "OFF"</li> <li>Shift lever "N"</li> <li>Cut off each injector signal one at a time using CONSULT-II.</li> </ul>	Engine runs rough or dies.	<ul> <li>Harness and connector</li> <li>Compression</li> <li>Injectors</li> <li>Power transistor</li> <li>Spark plugs</li> <li>Ignition coils</li> </ul>							
COOLING FAN	<ul> <li>Ignition switch: ON</li> <li>Turn the cooling fan "ON" and "OFF" using CONSULT-II.</li> </ul>	Cooling fan moves and stops.	<ul><li>Harness and connector</li><li>Cooling fan motor</li><li>Cooling fan relay</li></ul>							
FUEL PUMP RELAY	<ul> <li>Ignition switch: ON (Engine stopped)</li> <li>Turn the fuel pump relay "ON" and "OFF" using CONSULT-II and listen to operating sound.</li> </ul>	Fuel pump relay makes the operating sound.	<ul><li>Harness and connector</li><li>Fuel pump relay</li></ul>							
EGR VOL CONT/V	<ul> <li>Ignition switch: ON (Engine stopped)</li> <li>Change EGR volume control valve opening step using CON- SULT-II.</li> </ul>	EGR volume control valve makes an operating sound.	<ul><li>Harness and connector</li><li>EGR volume control valve</li></ul>							
PURG VOL CONT/V	<ul> <li>Engine: After warming up, run engine at 1,500 rpm.</li> <li>Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.</li> </ul>	Engine speed changes according to the opening percent.	<ul><li>Harness and connector</li><li>Solenoid valve</li></ul>							
SWIRL CONT SOL VALVE	<ul> <li>Ignition switch: ON</li> <li>Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound.</li> </ul>	Solenoid valve makes an operating sound.	Harness and connector     Solenoid valve							
VIAS SOL VALVE	<ul> <li>Ignition switch: ON</li> <li>Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound.</li> </ul>	Solenoid valve makes an operating sound.	<ul><li>Harness and connector</li><li>Solenoid valve</li></ul>							

CONSULT-II (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
ENGINE MOUNT-ING	<ul> <li>Engine: After warming up, run engine at idle speed.</li> <li>Gear position: "D" range (Vehicle stopped)</li> <li>Turn electronic controlled engine mount "IDLE" and "RAVEL" with the CONSULT-II.</li> </ul>	Body vibration changes according to the electronic controlled engine mount condition.	<ul> <li>Harness and connector</li> <li>Electronic controlled engine mount</li> </ul>

#### **DTC & SRT CONFIRMATION MODE SRT STATUS Mode**

NFEC0034S12

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-47.

#### **SRT Work Support Mode**

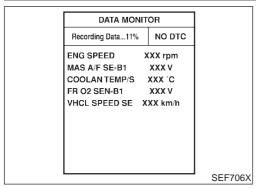
This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

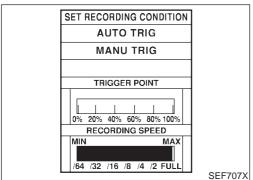
#### **DTC Work Support Mode**

NFEC0034S1203

Test mode	Test item	Condition	Reference page
		Condition	
	HO2S1 (B1) P0130		EC-165
	HO2S1 (B1) P0131		EC-175
	HO2S1 (B1) P0132		EC-183
HEATED OXYGEN	HO2S1 (B1) P0133		EC-191
SENSO 1 (FRONT)	HO2S1 (B2) P0150		EC-165
	HO2S1 (B2) P0151	Refer to corresponding	EC-175
	HO2S1 (B2) P0152		EC-183
	HO2S1 (B2) P0153		EC-191
	HO2S2 (B1) P0137	trouble diagnosis for DTC.	EC-219
	HO2S2 (B1) P0138		EC-230
HEATED OXYGEN SEN-	HO2S2 (B1) P0139		EC-241
SOR 2 (REAR)	HO2S2 (B2) P0157		EC-219
	HO2S2 (B2) P0158		EC-230
	HO2S2 (B2) P0159		EC-241
ECD CVCTEM	EGR SYSTEM P0400		EC-316
EGR SYSTEM	EGR SYSTEM P1402		EC-425

CONSULT-II (Cont'd)





# REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

CONSULT-II has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

- 1) "AUTO TRIG" (Automatic trigger):
- The malfunction will be identified on the CONSULT-II screen in real time.

In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.

At the moment a malfunction is detected by ECM, "MONITOR" in "DATA MONITOR" screen is changed to "Recording Data ... xx%" as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, "REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during "Recording Data ... xx%", "REAL-TIME DIAG" screen is also displayed.

The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.

- 2) "MANU TRIG" (Manual trigger):
- DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.

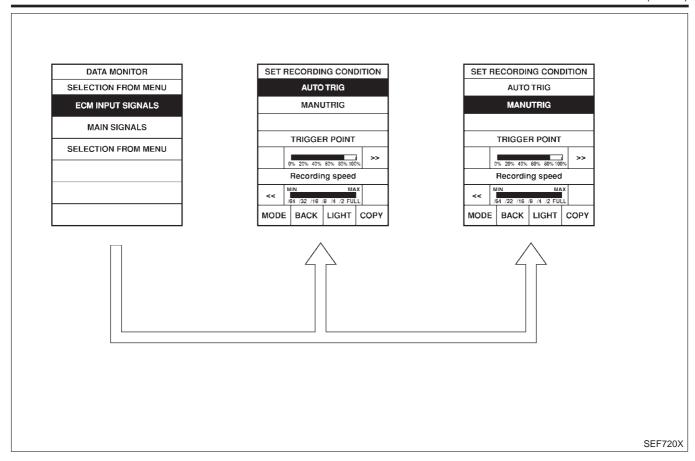
DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

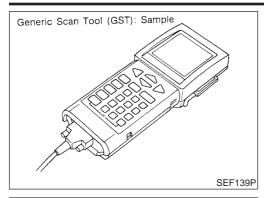
- 1) "AUTO TRIG"
- While trying to detect the DTC/1st trip DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.

When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC Confirmation Procedure", the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI-24, "Incident Simulation Tests".

- 2) "MANU TRIG"
- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



Generic Scan Tool (GST)

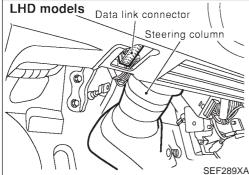


# Generic Scan Tool (GST) DESCRIPTION

=NFEC0866

Generic Scan Tool (OBDII scan tool) complying with ISO15031-4 has 8 different functions explained on the next page. ISO9141 is used as the protocol.

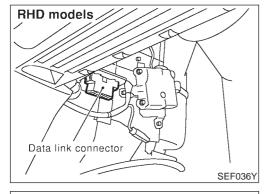
The name "GST" or "Generic Scan Tool" is used in this service manual.



#### **GST INSPECTION PROCEDURE**

NFEC0866S02

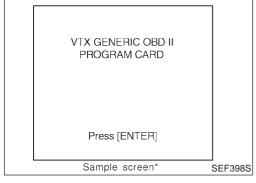
- Turn ignition switch OFF.
- 2. Connect "GST" to data link connector, which is located under the driver side dash panel.



Turn ignition switch ON.

4. Enter the program according to instruction on the screen or in the operation manual.

(\*: Regarding GST screens in this section, sample screens are shown.)



**OBD II FUNCTIONS** 

F0: DATA LIST

F1: FREEZE DATA

F2: DTCs

F3: SNAPSHOT

F4: CLEAR DIAG INFO

F5: O2 TEST RESULTS

#### F6: READINESS TESTS

F7: ON BOARD TESTS

F8: EXPAND DIAG PROT

F9: UNIT CONVERSION

Sample screen\*

SEF416S

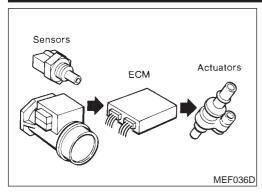
Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.

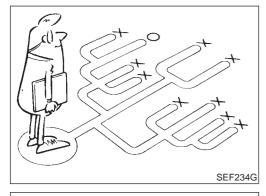
Generic Scan Tool (GST) (Cont'd)

	FUNCTION NFECOB66S03		
Dia	agnostic test mode	Function	
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, distance traveled while MI is activated and system status information.	
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. (For details, refer to "Freeze Frame Data", EC-46.)	
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.	
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes:  Clear number of diagnostic trouble codes (MODE 1)  Clear diagnostic trouble codes (MODE 3)  Clear trouble code for freeze frame data (MODE 1)  Clear freeze frame data (MODE 2)  Reset status of system monitoring test (MODE 1)  Clear on board monitoring test results (MODE 6 and 7)	
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.	
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.	
MODE 8		This mode is not applicable on this vehicle.	
MODE 9	(CALIBRATION ID)	This mode enables the off-board (External test equipment) to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.	

#### TROUBLE DIAGNOSIS — INTRODUCTION







#### **KEY POINTS**

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions,
Weather conditions,

Symptoms

SEF907L

#### Introduction

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the "Work Flow" on EC-90.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example on next page should be used.

Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

#### DIAGNOSTIC WORKSHEET

NFEC0036S0

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

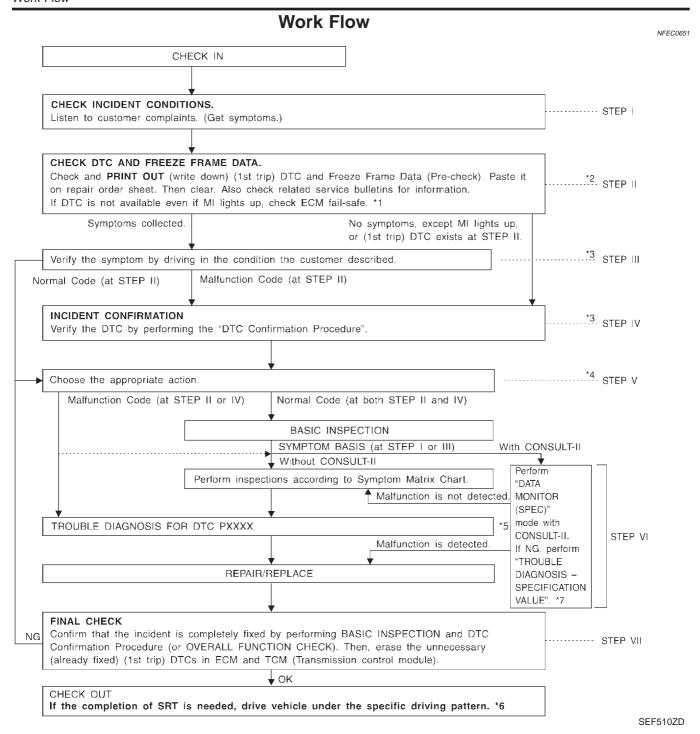
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

#### **Worksheet Sample**

NFEC0036S0101

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel		☐ Vehicle ran out of fuel causing misfire	
	☐ Startability	☐ Impossible to start ☐ No combus ☐ Partial combustion affected by th ☐ Partial combustion NOT affected ☐ Possible but hard to start ☐ Other	nrottle position d by throttle position
Symptoms	☐ Idling	☐ No fast idle ☐ Unstable ☐ F☐ Others [	High idle
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock☐ Intake backfire ☐ Exhaust backfi☐ Others [	☐ Lack of power re ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While dece ☐ Just after stopping ☐ While loadi	lerating
Incident occur	rence	☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night	☐ In the daytime
Frequency		☐ All the time ☐ Under certain cond	ditions
Weather cond	litions	☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing	Others [
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐	Cold Humid °F
		☐ Cold ☐ During warm-up ☐ /	After warm-up
Engine conditions		Engine speed	4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐ In suburbs ☐ Hig	hway
Driving conditions		□ Not affected     □ At starting    □ While idling     □ While accelerating    □ While cruis     □ While decelerating    □ While turning  Vehicle speed    □    □    □    □  0 20 40	•
Malfunction in	dicator	☐ Turned on ☐ Not turned on	

MTBL0513



- \*1 EC-109
- \*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform "TROUBLE DIAG-NOSIS FOR INTERMITTENT INCIDENT", EC-131.
- \*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.
- \*4 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-132.
- \*5 If malfunctioning part cannot be
- detected, perform "TROUBLE DIAGNOSIS FOR INTERMIT-TENT INCIDENT", EC-131.
- \*6 EC-51
- \*7 EC-127

	DESCRIPTION FOR WORK FLOW NFECO651S01
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-88.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-57, EC-60.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131. Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. See EC-110.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs.  The "DIAGNOSTIC WORK SHEET" and the freeze frame data are useful to verify the incident. Connect CON-SULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.  If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.  If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the "DTC Confirmation Procedure". Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST.  During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.  If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131. In case the "DTC Confirmation Procedure" is not available, perform the "Overall Function Check" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "Overall Function Check" is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV.  If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX.  If the normal code is indicated, proceed refer to "Basic Inspection", EC-92. If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TROUBLE DIAGNOSIS — SPECIFICATION VALUE". (Refer to EC-127.) (If malfunction is detected, proceed to "REPAIR/REPLACE".) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-110.)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts". Gently shake the related connectors, components or wiring harness with CONSULT-II set in "DATA MONITOR (AUTO TRIG)" mode.  Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-114, EC-119.  The "Diagnostic Procedure" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to GI-26, "Circuit Inspection".  Repair or replace the malfunction parts.  If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint.  Perform the "DTC Confirmation Procedure" and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-57, EC-60.)

#### **Basic Inspection**

NFEC0038

#### Precaution:

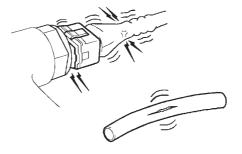
Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,
- Air conditioner switch is OFF,
- Rear window defogger switch is OFF,
- Steering wheel is in the straight-ahead position, etc.

On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.

#### INSPECTION START

- 1. Check service records for any recent repairs that may indicate a related problem, or a current need for scheduled maintenance.
- 2. Open engine hood and check the following:
- Harness connectors for improper connections
- Vacuum hoses for splits, kinks and improper connections
- Wiring for improper connections, pinches and cuts
- Air cleaner clogging
- Hoses and ducts for leaks



SEF983U

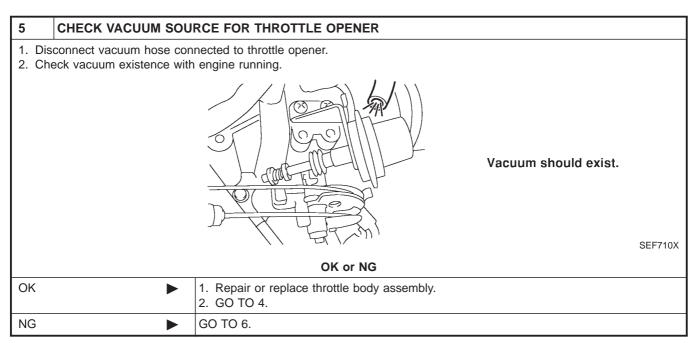
GO TO 2.

# Confirm that there is a clearance between throttle drum and stopper. Throttle opener Stopper OK or NG GO TO 4. NG GO TO 3.

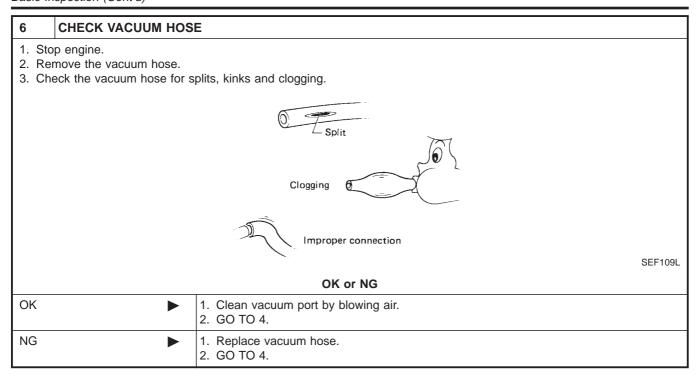
Basic Inspection (Cont'd)

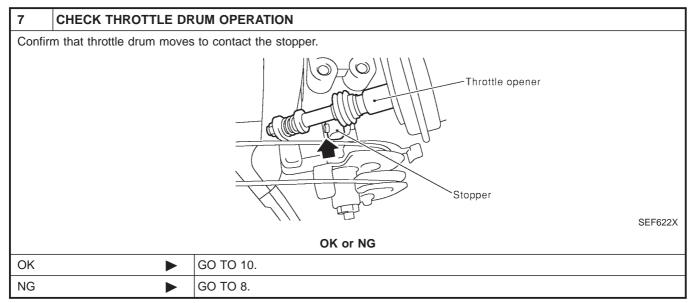
3	CHECK THROTTLE OF	PENER FIXING BOLTS	
Check	Check throttle opener fixing bolts for loosening.		
	OK or NG		
OK	•	<ol> <li>Repair or replace throttle body assembly.</li> <li>GO TO 2.</li> </ol>	
NG	<b>&gt;</b>	<ol> <li>Retighten the fixing bolts.</li> <li>GO TO 2.</li> </ol>	

# 



Basic Inspection (Cont'd)





8	CHECK ACCELERATOR WIRE INSTALLATION		
	<ol> <li>Stop engine.</li> <li>Check accelerator wire for slack.</li> </ol>		
	OK or NG		
OK	<b>&gt;</b>	GO TO 9.	
NG	<b>&gt;</b>	<ol> <li>Adjust accelerator wire. Refer to FE-3, "Adjusting Accelerator Wire".</li> <li>GO TO 7.</li> </ol>	

Basic Inspection (Cont'd)

9	CHECK THROTTLE VA	LVE OPERATION
	<ol> <li>Remove intake air ducts.</li> <li>Check throttle valve operation when moving throttle drum by hand.</li> </ol>	
	OK or NG	
OK	<b>&gt;</b>	<ol> <li>Retighten the throttle drum fixing nuts.</li> <li>GO TO 7.</li> </ol>
NG	<b>&gt;</b>	<ol> <li>Clean the throttle body and throttle valve.</li> <li>GO TO 7.</li> </ol>

#### 10 CHECK THROTTLE POSITION SWITCH CLOSED POSITION-I NOTE: Always check ignition timing before performing the following. 1. Warm up engine to normal operating temperature. 2. Stop engine. 3. Remove the vacuum hose connected to the throttle opener. 4. Connect suitable vacuum hose to vacuum pump as shown below. Throttle opener Vacuum pump Throttle opener rod should move up when the vacuum is applied. Stopper-Throttle drum (Never touch) 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum is free from the throttle opener rod. Models with CONSULT-II GO TO 11.

Models without CON-

SULT-II

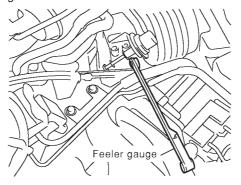
GO TO 15.

Basic Inspection (Cont'd)

#### 11 CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

#### (P) With CONSULT-II

- 1. Turn ignition switch "ON".
- 2. Select "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT-II.
- 3. Read "CLSD THL/P SW" signal under the following conditions.
- Insert a 0.05 mm (0.0020 in) and 0.15 mm (0.0059 in) feeler gauge alternately between stopper and throttle drum as shown in the figure and check the signal.



SEF576X

DATA MONITOR	
MONITOR	NO DTC
CLSD THL/P SW	ON

SEF173Y

"CLSD THL/P SW" signal should remain "ON" while inserting 0.05 mm (0.0020 in) feeler gauge. "CLSD THL/P SW" signal should remain "OFF" while inserting 0.15 mm (0.0059 in) feeler gauge.

#### OK or NG

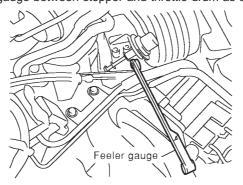
OK ►	GO TO 14.
NG ►	GO TO 12.

Basic Inspection (Cont'd)

#### 12 ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

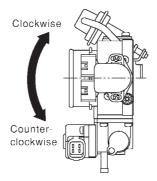
#### (P) With CONSULT-II

- 1. Loosen throttle position sensor fixing bolts.
- 2. Confirm that proper vacuum is applied. Refer to test No. 10. During adjustment, vacuum should be applied.
- 3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



SEF576X

4. Turn throttle position sensor body counterclockwise until "CLSD THL/P SW" signal switches to "OFF".



SEF670X

DATA MONITOR	
NO DTC	
OFF	

SEF305Y

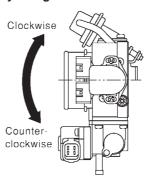
GO TO 13.

Basic Inspection (Cont'd)

#### 13 ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-II

#### (P) With CONSULT-II

- 1. Temporarily tighten sensor body fixing bolts as follows.
- Gradually move the sensor body clockwise and stop it when "CLSD THL/P SW" signal switches from "OFF" to "ON", then temporarily tighten sensor body fixing bolts.



SEF670X

- 2. Make sure two or three times that the signal is "ON" when the throttle valve is closed and "OFF" when it is opened.
- 3. Remove 0.05 mm (0.0020 in) feeler gauge then insert 0.15 mm (0.0059 in) feeler gauge.
- 4. Make sure two or three times that the signal remains "OFF" when the throttle valve is closed.
- 5. Tighten throttle position sensor.
- 6. Check the "CLSD THL/P SW" signal again.

The signal remains "OFF" while closing throttle valve.

OK or NG

ĺ	OK ►	GO TO 14.
	NG ►	GO TO 12.

Basic Inspection (Cont'd)

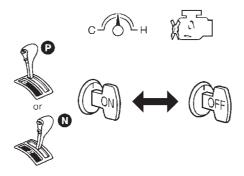
#### 14 RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

#### (P) With CONSULT-II

#### NOTE:

Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.

- 1. Confirm that proper vacuum is applied. Refer to Test No. 10.
- 2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
- 3. Start engine.
- 4. Warm up engine to normal operating temperature.
- 5. Select "CLSD THL POS" in "DATA MONITOR" mode.
- 6. Stop engine. (Turn ignition switch "OFF".)
- 7. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

- 8. Turn ignition switch "OFF" and wait at least 10 seconds.
- 9. Repeat steps 7 and 8 until "CLSD THL POS" signal changes to "ON".

DATA MONIT	OR
MONITOR	NO DTC
CLSD THL POS	ON

SEF061Y

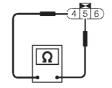
GO TO 19.

Basic Inspection (Cont'd)

#### 15 CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

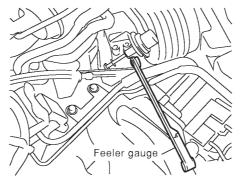
- 1. Disconnect closed throttle position switch harness connector.
- 2. Check continuity between closed throttle position switch terminals 4 and 5 under the following conditions.





SEF711X

• Insert the 0.05 mm (0.0020 in) and 0.15 mm (0.0059 in) feeler gauge alternately between the stopper and throttle drum as shown in the figure.



SEF576X

#### OK or NG

OK •	GO TO 18.
NG ►	GO TO 16.

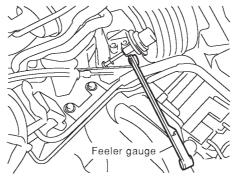
<sup>&</sup>quot;Continuity should exist" while inserting 0.05 mm (0.0020 in) feeler gauge.

<sup>&</sup>quot;Continuity should not exist" while inserting 0.15 mm (0.0059 in) feeler gauge.

Basic Inspection (Cont'd)

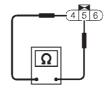
#### 16 ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

- 1. Loosen throttle position sensor fixing bolts.
- 2. Confirm that proper vacuum is applied. Refer to Test No. 10. During adjustment, vacuum should be applied.
- 3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



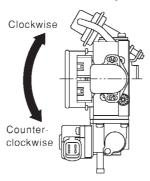
SEF576X





SEF711X

4. Turn throttle position sensor body counterclockwise until continuity does not exist.



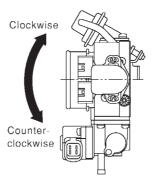
SEF670X

GO TO 17.

Basic Inspection (Cont'd)

#### 17 ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-II

- 1. Temporarily tighten sensor body fixing bolts as follows.
- Gradually move the sensor body clockwise and stop it when the continuity comes to exist, then temporarily tighten sensor body fixing bolts.



SEF670X

- 2. Make sure two or three times that the continuity exists when the throttle valve is closed and continuity does not exist when it is opened.
- 3. Remove 0.05 mm (0.0020 in) feeler gauge then insert 0.15 mm (0.0059 in) feeler gauge.
- 4. Make sure two or three times that the continuity does not exist when the throttle valve is closed.
- 5. Tighten throttle position sensor.
- 6. Check the continuity again.

Continuity does not exist while closing the throttle valve.

OK or NG

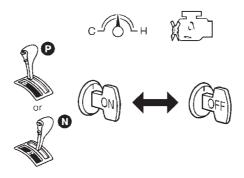
OK ▶	GO TO 18.
NG ►	GO TO 16.

#### 18 RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

#### NOTE:

Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.

- 1. Confirm that proper vacuum is applied. Refer to Test No. 10.
- 2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
- 3. Start engine.
- 4. Warm up engine to normal operating temperature.
- 5. Stop engine. (Turn ignition switch "OFF".)
- 6. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

- 7. Turn ignition switch "OFF" and wait at least 10 seconds.
- 8. Repeat steps 6 and 7, 20 times.

► GO TO 19.

Basic Inspection (Cont'd)

19	CHECK (1ST TRIP) DTO		
2. Re	1. Start engine and warm it up to normal operating temperature. 2. Rev (2,000 to 3,000 rpm) two or three times. 3. Make sure no (1st trip) DTC is displayed with CONSULT-II or GST.  OK or NG		
		OK OF NO	
OK	<b>&gt;</b>	GO TO 21.	
NG	<b>&gt;</b>	GO TO 20.	

20	REPAIR MALFUNCTION		
Repair	Repair or replace components as necessary according to corresponding "Diagnostic Procedure".		
<b>▶</b> GO TO 19.			

21	CHECK TARGET IDLE	SPEED	
1. Sta 2. Se	With CONSULT-II  1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed.  M/T: 625±50 rpm (VQ30DE engine)  M/T: 675±50 rpm (VQ20DE engine)  A/T: 700±50 rpm (in "P" or "N" position)		
1. Sta	Without CONSULT-II  1. Start engine and warm it up to normal operating temperature.  2. Check idle speed.  M/T: 625±50 rpm (VQ30DE engine)  M/T: 675±50 rpm (VQ20DE engine)  A/T: 700±50 rpm (in "P" or "N" position)		
	OK or NG		
OK	<b>•</b>	GO TO 31.	
NG	<b>•</b>	GO TO 22.	

22	PERFORM IDLE AIR V	OLUME LEARNING	
	Refer to "Idle Air Volume Learning", EC-41.  Which is the result CMPLT or INCMP?		
	CMPLT or INCMP		
CMPL	T ▶	GO TO 23.	
INCMF	<b>&gt;</b>	<ol> <li>Follow the construction of "Idle Air Volume Leaning".</li> <li>GO TO 22.</li> </ol>	

Basic Inspection (Cont'd)

#### 23 **CHECK TARGET IDLE SPEED AGAIN** (P) With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. M/T: 625±50 rpm (VQ30DE engine) M/T: 675±50 rpm (VQ20DE engine) A/T: 700±50 rpm (in "P" or "N" position) Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. M/T: 625±50 rpm (VQ30DE engine) M/T: 675±50 rpm (VQ20DE engine) A/T: 700±50 rpm (in "P" or "N" position) OK or NG OK GO TO 29. NG (Models with Euro-GO TO 25. OBD system) NG (Models without GO TO 24. Euro-OBD system)

24	CHECK IACV-AAC VALVE CIRCUIT FOR OPEN AND SHORT	
	<ol> <li>Turn ignition switch "OFF".</li> <li>Check IACV-AAC valve circuit for open and short. Refer to "Diagnostic Procedure", EC-522.</li> </ol>	
	OK or NG	
OK	<b>•</b>	GO TO 25.
NG	•	<ol> <li>Repair or replace.</li> <li>GO TO 26.</li> </ol>

25	REPLACE IACV-AAC VALVE	
Replac	Replace IACV-AAC valve.	
	<b>•</b>	GO TO 26.

26	PERFORM IDLE AIR V	OLUME LEARNING
	Refer to "Idle Air Volume Learning", EC-41.  Which is the result CMPLT or INCMP?	
	CMPLT or INCMP	
CMPL	Τ ▶	GO TO 27.
INCM	<b>&gt;</b>	<ol> <li>Follow the construction of "Idle Air Volume Learning".</li> <li>GO TO 22.</li> </ol>

Basic Inspection (Cont'd)

#### 27 CHECK TARGET IDLE SPEED AGAIN

#### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II.
- 3. Check idle speed.

M/T: 625±50 rpm (VQ30DE engine) M/T: 675±50 rpm (VQ20DE engine) A/T: 700±50 rpm (in "P" or "N" position)

#### Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.

2. Check idle speed.

M/T: 625±50 rpm (VQ30DE engine) M/T: 675±50 rpm (VQ20DE engine) A/T: 700±50 rpm (in "P" or "N" position)

OK or NG

OK	<b>&gt;</b>	GO TO 29.
NG	<b>•</b>	GO TO 28.

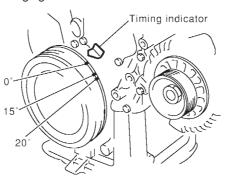
#### 28 CHECK ECM FUNCTION

- 1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.)
- 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM NATS)", EC-61.

■ GO TO 22.

#### 29 CHECK IGNITION TIMING

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check ignition timing at idle using a timing light.



SEF572X

#### **Ignition timing:**

M/T 15°±5° BTDC (VQ30DE engine) M/T 9°±5° BTDC (VQ20DE engine)

A/T 15°±5° BTDC (in "P" or "N" position) (VQ30DE engine)

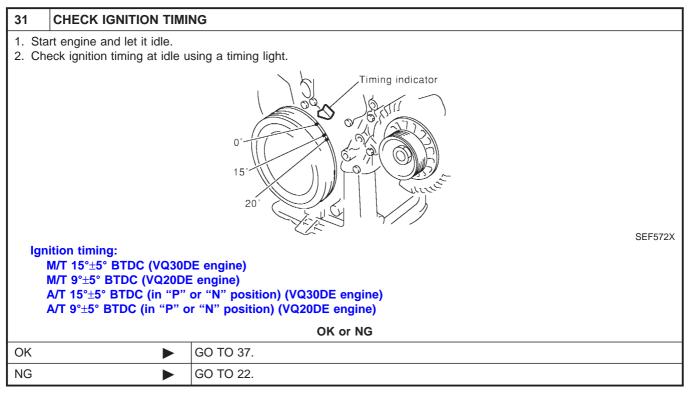
A/T 9°±5° BTDC (in "P" or "N" position) (VQ20DE engine)

OK or NG

OK ▶	GO TO 37.
NG ▶	GO TO 30.

Basic Inspection (Cont'd)

30	CHECK TIMING CHAIN INSTALLATION		
Check timing chain installation. Refer to EM-29, "Installation".			
	OK or NG		
OK	<b>•</b>	GO TO 28.	
NG	<b>&gt;</b>	<ol> <li>Repair the timing chain installation.</li> <li>GO TO 22.</li> </ol>	



32	PERFORM IDLE AIR V	OLUME LEARNING	
	Refer to "Idle Air Volume Learning", EC-41.  Which is the result CMPLT or INCMP?		
	CMPLT or INCMP		
CMPL	.T <b>▶</b>	GO TO 33.	
INCM	P	<ol> <li>Follow the construction of "Idle Air volume Learning".</li> <li>GO TO 32.</li> </ol>	

Basic Inspection (Cont'd)

#### 33 CHECK TARGET IDLE SPEED AGAIN

#### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II.
- 3. Check idle speed.

M/T: 625±50 rpm (VQ30DE engine) M/T: 675±50 rpm (VQ20DE engine) A/T: 700±50 rpm (in "P" or "N" position)

#### Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.

2. Check idle speed.

M/T: 625±50 rpm (VQ30DE engine) M/T: 675±50 rpm (VQ20DE engine) A/T: 700±50 rpm (in "P" or "N" position)

OK or NG

OK	<b>&gt;</b>	GO TO 35.
NG	<b>•</b>	GO TO 34.

#### 34 CHECK ECM FUNCTION

- Substitute another known-good ECM to check ECM function.
   (ECM may be the cause of a problem, but this is rarely the case.)
- 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM NATS)", EC-61.

► GO TO 32.

35	CHECK IGNITION TIMING AGAIN		
Check	Check ignition timing again. Refer to Test No. 31.		
	OK or NG		
OK	•	GO TO 37.	
NG	<b>•</b>	GO TO 36.	

36	CHECK TIMING CHAIN INSTALLATION		
Check	Check timing chain installation. Refer to EM-29, "Installation".		
	OK or NG		
OK	<b>&gt;</b>	GO TO 34.	
NG	<b>&gt;</b>	<ol> <li>Repair the timing chain installation.</li> <li>GO TO 32.</li> </ol>	

# After this inspection, unnecessary DTC No. might be displayed. Erase the stored memory in ECM and TCM (Transmission control module). Refer to "How to Erase Emission-Related Diagnostic Information", EC-57 and AT-38, "HOW TO ERASE DTC".

**▶** INSPECTION END

### TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

DTC Inspection Priority Chart

#### **DTC Inspection Priority Chart**

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)
1	<ul> <li>P0100 Mass air flow sensor</li> <li>P0110 Intake air temperature sensor</li> <li>P0115 Engine coolant temperature sensor</li> <li>P0120 Throttle position sensor</li> <li>P0180 Fuel tank temperature sensor</li> <li>P0325 Knock sensor</li> <li>P0335 P1336 Crankshaft position sensor (POS)</li> <li>P0340 Camshaft position sensor (PHASE)</li> <li>P0403 EGR volume control valve</li> <li>P0500 Vehicle speed sensor</li> <li>P0605 ECM</li> <li>P1320 Ignition signal</li> <li>P1335 Crankshaft position sensor (REF)</li> <li>P1605 A/T diagnosis communication line</li> <li>P1706 Park/Neutral position (PNP) switch</li> </ul>
2	<ul> <li>P0130-P0134, P0150-P0154 Heated oxygen sensor 1 (front)</li> <li>P0135 P0155 Heated oxygen sensor 1 heater (front)</li> <li>P0137-P0140, P0157-P0160 Heated oxygen sensor 2 (rear)</li> <li>P0141 P0161 Heated oxygen sensor 2 heater (rear)</li> <li>P0443 EVAP canister purge volume control solenoid valve</li> <li>P0510 Closed throttle position switch</li> <li>P0705-P0755 P1705 P1760 A/T related sensors, solenoid valves and switches</li> <li>P1401 EGR temperature sensor</li> </ul>
3	<ul> <li>P0171 P0172 P0174 P0175 Fuel injection system function</li> <li>P0306 - P0300 Misfire</li> <li>P0400 P1402 EGR function</li> <li>P0420 P0430 Three way catalyst function</li> <li>P0505 IACV-AAC valve</li> <li>P0731-P0734 A/T function</li> <li>P1131 Swirl control valve control solenoid valve</li> </ul>

#### **Fail-safe Chart**

The ECM enters fail-safe mode, if any of the following malfunctions is detected due to the open or short circuit. When the ECM enters the fail-safe mode of ECM, the MI illuminates.

DTC No.	Detected items	Engine operating condition in fail-	safe mode				
P0100	Mass air flow sensor circuit	Engine speed will not rise more the	han 2,400 rpm due to the fuel cut.				
P0115	Engine coolant temperature sensor circuit	turning ignition switch "ON" or "S	re determined by ECM based on the time after TART". coolant temperature decided by ECM.				
		Condition	Engine coolant temperature decided (CONSULT-II display)				
		Just as ignition switch is turned ON or Start	40°C (104°F)				
		More than approx. 4 minutes after ignition ON or Start	80°C (176°F)				
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)				
P0120	Throttle position sensor circuit	Throttle position will be determine engine speed. Therefore, acceleration will be po	ed based on the injected fuel amount and the or.				
		Condition	Driving condition				
		When engine is idling	Normal				
		When accelerating	Poor acceleration				
P0403*	EGR volume control valve circuit	Engine speed will not rise more the	han 2,800 rpm due to the fuel cut.				
P1335	Crankshaft position sensor (REF) circuit		ignal) is controlled by camshaft position sensor osition sensor (POS) signal. Ignition timing will be				
Unable to access ECM	ECM	When the fail-safe system activat tion in the CPU of ECM), the MI of However it is not possible to acceed Engine control with fail-safe When ECM fail-safe is operating,	on  CM was judged to be malfunctioning. es (i.e., if the ECM detects a malfunction condition the instrument panel lights to warn the driver. ess ECM and DTC cannot be confirmed.  fuel injection, ignition timing, fuel pump operation pooling fan operation are controlled under certain				
			ECM fail-safe operation				
		Engine speed	Engine speed will not rise more than 3,000 rpm				
		Fuel injection	Simultaneous multiport fuel injection system				
		Ignition timing	Ignition timing is fixed at the preset valve				
		Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls				
		IACV-AAC valve	Full open				
		Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engin stalls.				
		Replace ECM, if ECM fail-safe condition is confirmed.					

<sup>\*:</sup> Models with EURO-OBD system

#### Symptom Matrix Chart SYSTEM — BASIC ENGINE CONTROL SYSTEM

NFEC0041

		S	YS	IEW	ı —	BA	SIC	EN(	GINE	CC	)NI	ROI	_ 51	151	LIVI
							S`	YMPT	ОМ						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty	symptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-583
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-37
	Injector circuit	1	1	2	3	2		2	2			2			EC-573
	Evaporative emission system														EC-32
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-35
	Incorrect idle speed adjustment						1	1	1	1		1			EC-92
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-347, 519
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-92
	Ignition circuit	1	1		2	2		2	2			2			EC-391, EC-545
EGR	EGR volume control valve circuit			2											EC-325, 498
	EGR system		2		3	3						3			EC-316, 425, 498
Main power supply and ground circuit		2	2	3				3	3		2				EC-132
Air conditioner circuit		_	_	3			3		3	3				2	HA section

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next page)

Symptom Matrix Chart (Cont'd)

			SYMPTOM												
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
Warranty	symptom code	AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Engine control	Crankshaft position sensor (REF) circuit														EC-402
	Crankshaft position sensor (POS) circuit	2	2												EC-302, 490, 409
	Camshaft position sensor (PHASE) circuit	3													EC-310
	Mass air flow sensor circuit	1			2										EC-139
	Heated oxygen sensor 1 (front) circuit														EC-165, 454
	Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-151
	Throttle position sensor circuit						2			2					EC-156
	Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-92
	Vehicle speed sensor circuit		2	3		3									EC-343, 515
	Knock sensor circuit			2								3			EC-296
	ECM	2	2	3	3	3	3	3	3	3	3				EC-109, 365
	Start signal circuit	2													EC-579
	Park/Neutral position switch circuit			3		3						3			EC-437, 560
	Power steering oil pressure switch circuit		2					3	3						EC-593
	Electronic controlled engine mount control circuit							3	3						EC-589
	Electrical load signal circuit														EC-602

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next page)

Symptom Matrix Chart (Cont'd)

		S	YS	ГЕМ	I —	EN	GIN	E M	ECH	ANI	CAI	_ &	OTI	HER	NFEC0041S02
							S`	YMPT	ОМ						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	нідн іргелом ірге	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference section
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Fuel	Fuel tank	5													FE section
	Fuel piping	Ů		5	5	5		5	5			5			
	Vapor lock		5												
	Valve deposit														
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			_
Air	Air duct														
	Air cleaner														
	Air leakage from air duct (Mass air flow sensor — throttle body)		5	5		5		5	5			5			
	Throttle body, Throttle wire	5			5		5			5					FE section
	Air leakage from intake manifold/ Collector/Gasket														_
Cranking	Battery					_					1	_			
	Alternator circuit	1	1	1		1		1	1			1		1	EL section
	Starter circuit	3											1		
	Flywheel/Drive plate	6													EM section
	PNP switch	4													AT section

<sup>1 - 6:</sup> The numbers refer to the order of inspection. (continued on next page)

# Symptom Matrix Chart (Cont'd)

							S	YMPT	ОМ						
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference section
Warranty	symptom code	AA	АВ	AC	AD	AE	AF	AG	АН	AJ	AK	AL	AM	НА	
Engine	Cylinder head	- 5	5	5	5	5		5	5			5			
	Cylinder head gasket										4		3		
	Cylinder block														
	Piston												4		
	Piston ring	6	6	6	6	6		6	6			6			
	Connecting rod														EM section
	Bearing														
	Crankshaft														
Valve mecha-	Timing chain														
nism	Camshaft	5	5	5	5	5		5	5			5			
	Intake valve												3		
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5	5	5		5					FE section
	Three way catalyst														
Lubrica- tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			MA, EM, LC section
	Oil level (Low)/Filthy oil														LC section
Cooling	Radiator/Hose/Radiator filler cap														
	Thermostat									5					
	Water pump														
	Water gallery	5	5	5	5	5		5	5		4	5			
	Cooling fan									5					EC section
	Coolant level (low)/Contaminated coolant														MA section

<sup>1 - 6:</sup> The numbers refer to the order of inspection.

						S	YMPT	ОМ						
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference section
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	НА	
NVIS (NISSAN Vehicle Immobilizer System — NATS)	1	1												EC-61 or EL section

<sup>1 - 6:</sup> The numbers refer to the order of inspection.

# **CONSULT-II Reference Value in Data Monitor Mode**

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  - \* Specification data may not be directly related to their components signals/values/operations.
- i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CON	IDITION	SPECIFICATION		
ENG SPEED CKPS-RPM (POS)	Tachometer: Connect     Run engine and compare tachon value.	Almost the same speed as the CONSULT-II value.			
POS COUNT	Engine: Running		179 - 181		
MAS A/F SE-B1	<ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul>	Idle	1.2 - 1.8V		
IVIAS AVF SE-BT	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,500 rpm	1.6 - 2.2V		
COOLAN TEMP/S	Engine: After warming up	More than 70°C (158°F)			
HO2S1 (B1) HO2S1 (B2)		Maintainin nanina anadat 0.000	0 - 0.3V ←→ Approx. 0.6 - 1.0V		
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.		
HO2S2 (B1) HO2S2 (B2)	• Engine, After warming up	Maintaining engine speed at 2,000	0 - 0.3V ←→ Approx. 0.6 - 1.0V		
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	, ,	rpm	$LEAN \longleftrightarrow RICH$		

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CON	IDITION	SPECIFICATION
		speedometer indication with the CON-	Almost the same speed as
VHCL SPEED SE	SULT-II value		the CONSULT-II value
BATTERY VOLT	Ignition switch: ON (Engine stopp)	ped)	11 - 14V
	Engine: After warming up, idle the engine	Throttle valve: fully closed	0.15 - 0.85V
THRTL POS SEN	<ul><li>Engine: After warming up</li><li>Ignition switch: ON (Engine stopped)</li></ul>	Throttle valve: fully opened	3.5 - 4.7V
EGR TEMP SEN	Engine: After warming up		Less than 4.5V
START SIGNAL	ullet Ignition switch: ON $ o$ START $ o$	ON	$OFF \to ON \to OFF$
CLSD THL/P SW	Engine: After warming up, idle	Throttle valve: Idle position	ON
CLSD THL POS	the engine	Throttle valve: Slightly open	OFF
	• Engine: After warming up idle	Air conditioner switch: "OFF"	OFF
AIR COND SIG	Engine: After warming up, idle the engine	Air conditioner switch: "ON" (Compressor operates.)	ON
P/N POSI SW	Ignition switch: ON	Shift lever: "P" or "N" (A/T models) Neutral (M/T models)	ON
		Except above	OFF
PW/ST SIGNAL	Engine: After warming up, idle	Steering wheel in neutral position (forward direction)	OFF
I W/OI GIGIVAL	the engine	The steering wheel is turned	ON
AMB TEMP SW	Ignition switch: ON     Compare ambient air tempera-	Below 19°C (66°F)	OFF
	ture with the following:	Above 25°C (77°F)	ON
IGNITION SW	• Ignition switch: $ON \rightarrow OFF \rightarrow OI$	N	$ON \to OFF \to ON$
INJ PULSE-B2	<ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul>	Idle	2.4 - 3.2 msec
INJ PULSE-B1	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	1.9 - 2.8 msec
B/FUEL SCHDL	<ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul>	Idle	2.0 - 3.2 msec
D/I OLE GOLIDE	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	1.4 - 2.6 msec
IGN TIMING	<ul> <li>Engine: After warming up</li> <li>Air conditioner switch: "OFF"</li> </ul>	Idle	9°±5° BTDC (VQ20DE) 15°±5° BTDC (VQ30DE)
	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	More than 25° BTDC
IACV-AAC/V	Engine: After warming up     Air conditioner switch: "OFF"	Idle	2 - 10 step
1/10 V-MAO/ V	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	_
PURG VOL C/V	Engine: After warming up     Air conditioner switch: "OFF"	Idle	0 %
	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	_
A/F ALPHA-B2 A/F ALPHA-B1	Engine: After warming up	Maintaining engine speed at 2,000 rpm	54 - 155%
AIR COND RLY	Air conditioner switch: OFF → O	N	$OFF \to ON$
	<u> </u>		

CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CON	NDITION	SPECIFICATION	
FUEL PUMP RLY	Ignition switch is turned to ON (0     Engine running and cranking	Operates for 5 seconds)	ON	
	Except as shown above		OFF	
		Engine coolant temperature is 94°C (201°F) or less	OFF	
COOLING FAN	<ul><li>After warming up engine, idle the engine.</li><li>Air conditioner switch: "OFF"</li></ul>	Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	Low	
		Engine coolant temperature is 105°C (221°F) or more	HIGH	
	Engine: After warming up     Air and different positions (CEE)	Idle	0 step	
EGR VOL CON/V	<ul><li>Air conditioner switch: "OFF"</li><li>Shift lever: "N"</li><li>No-load</li></ul>	Engine speed: Revving from idle up to 3,000 rpm quickly	10 - 55 step	
HO2S1 HTR (B1)	• Engine speed: Below 3,600 rpm		ON	
HO2S1 HTR (B2)	• Engine speed: Above 3,600 rpm		OFF	
HO2S2 HTR (B1)	Ignition switch: ON (Engine stop)     Engine speed: Above 3,600 rpm		OFF	
HO2S2 HTR (B2)	Engine speed: Below 3,600 rpm of 70 km/h (43 MPH) or more]	ON		
CAL/LD VALUE	Engine: After warming up     Air conditioner switch: "OFF"	Idle	14.0 - 33.0%	
ONDED WILDE	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,500 rpm	12.0 - 25.0%	
	Engine: After warming up	Throttle valve: fully closed	0.0%	
ABSOL TH-P/S	<ul><li>Engine: After warming up</li><li>Ignition switch: ON (Engine stopped)</li></ul>	Throttle valve: fully opened	Approx. 80%	
MASS AIRFLOW	<ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul>	Idle	2.0 - 6.0 g·m/s	
IVIAGG AIITI LOW	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,500 rpm	7.0 - 20.0 g·m/s	
ABSOL PRES/SE	Ignition switch: ON		Approx. 4.4V	
SWRL CONT S/V	Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON	
	E	Engine coolant temperature is above 50°C (122°F).	OFF	
ENCINE MOUNT	Engine: Running	Idle	"IDLE"	
ENGINE MOUNT	Engine. Running	2,000 rpm	"TRVL"	

#### Major Sensor Reference Graph in Data Monitor Mode

The following are the major sensor reference graphs in "DATA MONITOR" mode.

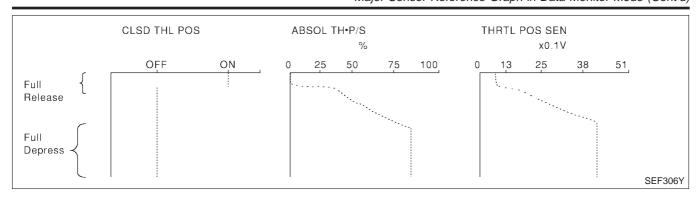
NFEC0043

#### THRTL POS SEN, ABSOL TH-P/S, CLSD THL POS

Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL POS" when depressing the accelerator pedal with the ignition switch "ON".

The signal of "THRTL POS SEN" and "ABSOL TH-P/S" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from "ON" to "OFF".

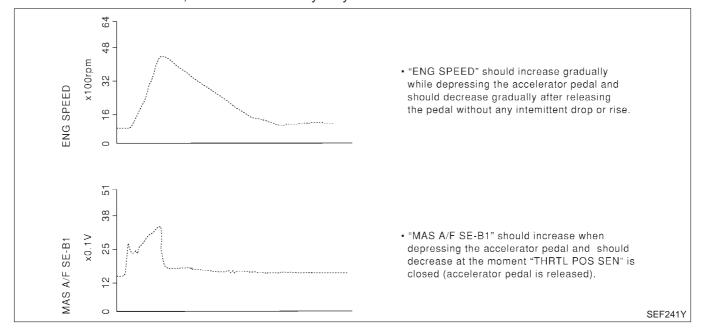
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)

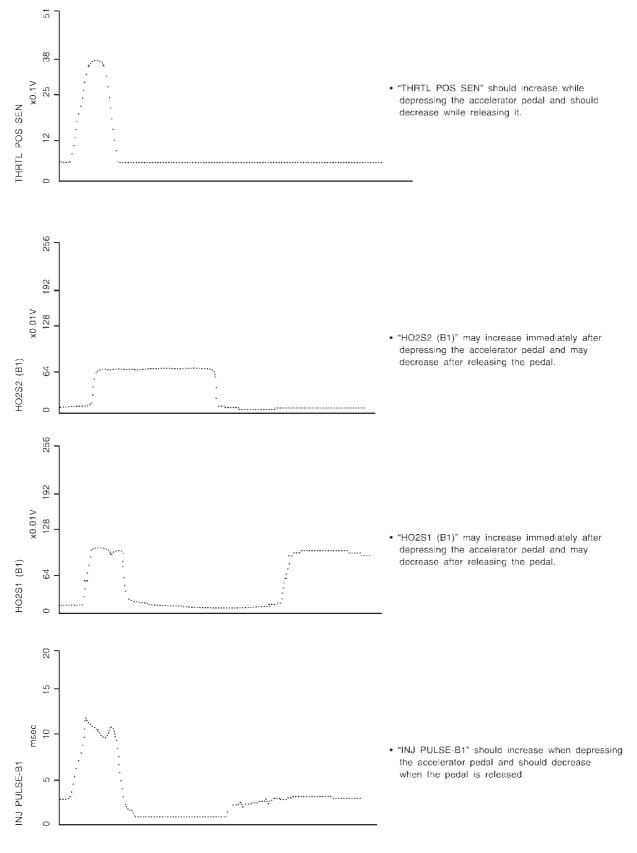


#### ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

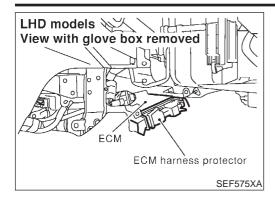
Below is the data for "ENG SPEED", "MAS A/F SE-B1", "THRTL POS SEN", "HO2S2 (B1)", "HO2S1 (B1)" and "INJ PULSE-B1" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

Each value is for reference, the exact value may vary.





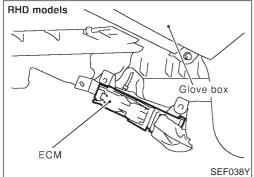
ECM Terminals and Reference Value



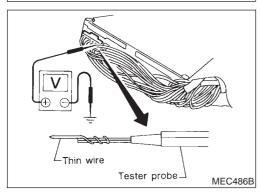
#### **ECM Terminals and Reference Value PREPARATION**

NFEC0044

NFFC0044S01 1. ECM is located behind the instrument lower cover. For this inspection, remove instrument lower cover.

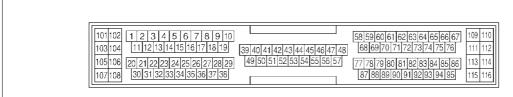


2. Remove ECM harness protector.



- Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
- Open harness securing clip to make testing easier.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

# ECM HARNESS CONNECTOR TERMINAL LAYOUT





SEF970W

#### **ECM INSPECTION TABLE**

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
		EVAP canister purge	[Engine is running]  ● Idle speed	BATTERY VOLTAGE (11 - 14V) (V) 40 20 0 50 ms
1	PU/R	volume control sole- noid valve	<ul> <li>[Engine is running]</li> <li>● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).</li> </ul>	BATTERY VOLTAGE (11 - 14V)  (V) 40 20 0 50 ms  SEF995U
2	R/L	Heated oxygen sensor	[Engine is running] • Engine speed is below 3,600 rpm.	0 - 1.0V
2	IV.L	1 heater (front) (B2)	[Engine is running] • Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
	00/1	Heated oxygen sensor	[Engine is running] • Engine speed is below 3,600 rpm.	0 - 1.0V
3	OR/L	1 heater (front) (B1)	[Engine is running] ■ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
4	D/I	Heated oxygen sensor	<ul> <li>[Engine is running]</li> <li>Engine speed is below 3,600 rpm.</li> <li>After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.</li> </ul>	0 - 1.0V
4	R/L	2 heater (rear) (B2)	[Ignition switch "ON"]  ■ Engine stopped [Engine is running]  ■ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
5	P/B	Heated oxygen sensor	<ul> <li>[Engine is running]</li> <li>Engine speed is below 3,600 rpm.</li> <li>After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.</li> </ul>	0 - 1.0V
5	F/B	2 heater (rear) (B1)	[Ignition switch "ON"]  ■ Engine stopped [Engine is running]  ■ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
6 7 8 17	W/PU Y/B Y GY/L	IACV-AAC valve	[Engine is running]  ● Idle speed	0.1 - 14V
9 10 18 19	G L/B BR P	EGR volume control valve	[Engine is running]  ● Idle speed	0.1 - 14V

				, ,			
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)			
16	Y/G	VIAS control solenoid	[Engine is running]  • Idle speed	BATTERY VOLTAGE (11 - 14V)			
	17.G	valve	[Engine is running] ■ Engine speed is above 5,000 rpm.	0 - 1.0V			
21 22 23	Y/R G/R L/R	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3	[Engine is running]  ■ Warm-up condition  ■ Idle speed	0 - 0.2V*  (V) 4 2 0 100 ms  SEF399T			
30 31 32	30 GY Ignition signal No. 4 31 PU/W Ignition signal No. 5	Ignition signal No. 4 Ignition signal No. 5 Ignition signal No. 6	[Engine is running]  • Warm-up condition  • Engine speed is 2,500 rpm.	0.1 - 0.3V★  (V) 4 2 0 100 ms  SEF645T			
25	W/G	Techamotor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Idle speed</li></ul>	10 - 11V★  (V) 20 10 0 20 ms  SEF579X			
25	W/G	Tachometer	[Engine is running]  ■ Warm-up condition  ■ Engine speed is 2,500 rpm.	10 - 11V★  (V) 20 10 0  20 ms  SEF580X			
26	W/B	ECM relay (Self shutt-off)	[Engine is running] [Ignition switch "OFF"]  ● For a few seconds after turning ignition switch "OFF"	0 - 1.5V			
		(Son Shake Oil)	[Ignition switch "OFF"]  ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)			
27	B/R	Air conditioner relay	[Engine is running]  ■ Both A/C switch and blower switch are "ON" (Compressor is operating).	0 - 1.0V			
			[Engine is running]  ■ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)			

ECM Terminals and Reference Value (Cont'd)

Idle speed   Odically.					
For 1 second after turning ignition switch "ON"   Gright purp relay   Fuel pump relay   Fuel pump relay   Fuel pump relay   Fuel Engine is running   Fuel pump relay   Fuel Engine os and the running ignition switch "ON"	NAL		ITEM	CONDITION	DATA (DC Voltage)
Ilgnition switch "ON"]   • 1 second passed after turning ignition switch "C1"     • 1 second passed passed after turning ignition switch "C1"     • 1 second passed pass	28	B/D	Fuel pump relay	For 1 second after turning ignition switch "ON"	0 - 1.5V
Swirl control valve control solenoid Valve   Swirl control valve control solenoid valve   Engine coolant temperature is between 15 to 50°C (59 to 122°F).   Engine is running]   • Ides peed   Engine coolant temperature is above 50°C (11 - 14V)	20	B/F	Tuel pump relay	1 second passed after turning ignition switch	
Incomplete   Inc	20	G	Swirl control valve con-	<ul><li>Idle speed</li><li>Engine coolant temperature is between 15 to</li></ul>	0 - 1.0V
Cooling fan relay (High)   Cooling fan is operating at high speed.   Coling fan is operating.	23	G	trol solenoid valve	<ul><li>Idle speed</li><li>Engine coolant temperature is above 50°C</li></ul>	
Engine is running	24	I.G.	Cooling fan relay		0 - 1.0V
Service Cooling fan relay (Low)    Cooling fan is operating.	34	LG	(High)		
Engine is running    Cooling fan is not operating.   BATTERY VOLTAGE (11 - 14V)	25	DD/D	Cooling for rolay (Low)		0 - 1.0V
36 Y A/T signal No. 3		BIVIX	Cooling lan relay (Low)		
LG	36	Y	A/T signal No. 3		Output voltage fluctuates peri-
LG/B   MI   [Engine is running]   BATTERY VOLTAGE (11 - 14V)     42   BR/W   Start signal   [Ignition switch "ON"]   Approximately 0V     1   [Ignition switch "START"]   9 - 12V     2   [Ignition switch "OFF"]   0V     3   R   Ignition switch "OFF"]   BATTERY VOLTAGE (11 - 14V)     4   G/OR (A/T) G/W (M/T)   PNP switch   Gear position is "Neutral position" (M/T models).   Approximately 0V     6   Gear position is "P" or "N" (A/T models).     6   [Ignition switch "ON"]   BATTERY VOLTAGE (11 - 14V)     7   G/W (M/T)   BATTERY VOLTAGE (11 - 14V)     8   G/B   Air conditioner switch signal   Both A/C switch and blower switch are "ON".   Approximately 0V     8   G/B   Both A/C switch and blower switch are "ON".   Approximately 0V     8   G/B   Both A/C switch and blower switch are "ON".   Approximately 0V     8   G/B   Both A/C switch and blower switch are "ON".   Approximately 0V     8   G/B   Both A/C switch and blower switch are "ON".   Approximately 0V     8   G/B   G/B   Both A/C switch and blower switch are "ON".   Approximately 0V     8   G/B   37	LG	A/T signal No. 5		Output voltage fluctuates peri-	
BR/W   Start signal   [Ignition switch "ON"]   Approximately 0V				[Ignition switch "ON"]	0 - 1.0V
42 BR/W Start signal  [Ignition switch "START"] 9 - 12V  [Ignition switch "OFF"] 0V  43 R Ignition switch  [Ignition switch "ON"] BATTERY VOLTAGE (11 - 14V)  [Ignition switch "ON"] • Gear position is "Neutral position" (M/T models).  [Ignition switch "ON"] • Gear position is "P" or "N" (A/T models).  [Ignition switch "ON"] BATTERY VOLTAGE (11 - 14V)	38	LG/B	MI	- 0	
[Ignition switch "START"] 9 - 12V  [Ignition switch "OFF"] 0V  [Ignition switch "ON"] BATTERY VOLTAGE (11 - 14V)  [Ignition switch "ON"] • Gear position is "Neutral position" (M/T models). • Gear position is "P" or "N" (A/T models).  [Ignition switch "ON"] BATTERY VOLTAGE (11 - 14V)  [Ignition switch "ON"] BATTERY VOLTAGE (11 - 14V)  [Ignition switch "ON"] BATTERY VOLTAGE (11 - 14V)  [Ignition switch "ON"] Approximately 0V				[Ignition switch "ON"]	Approximately 0V
Ignition switch   Ignition s	42	BR/W	Start signal	[Ignition switch "START"]	9 - 12V
[Ignition switch "ON"]  G/OR (A/T) G/W (M/T)  FNP switch  PNP switch  PNP switch  PNP switch  FNP switch  G/B  Air conditioner switch				[Ignition switch "OFF"]	0V
G/OR (A/T) G/W (M/T)  PNP switch  • Gear position is "Neutral position" (M/T models). • Gear position is "P" or "N" (A/T models).  [Ignition switch "ON"] • Except the above gear position  Approximately 0V  BATTERY VOLTAGE (11 - 14V)  [Engine is running] • Both A/C switch and blower switch are "ON".  Approximately 0V	43	R	Ignition switch	[Ignition switch "ON"]	
(M/T)  [Ignition switch "ON"]  • Except the above gear position  [Engine is running]  • Both A/C switch and blower switch are "ON".  BATTERY VOLTAGE (11 - 14V)  Approximately 0V	44	(A/T)	PNP switch	<ul> <li>Gear position is "Neutral position" (M/T models).</li> </ul>	Approximately 0V
45 G/B Air conditioner switch		l			
	15	G/R	Air conditioner switch		Approximately 0V
• A/C switch is "OFF". (11 - 14V)	40	G/D	signal	[Engine is running]  ● A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
46	W/L	Ambient air tempera-	<ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Ambient air temperature is above 25°C (77°F).</li> <li>Air conditioner is operating.</li> </ul>	ov	
40	VV/L	ture switch signal	<ul> <li>[Engine is running]</li> <li>● Idle speed</li> <li>● Ambient air temperature is above 25°C (77°F).</li> <li>● Air conditioner is not operating.</li> </ul>	Approximately 5V	
47	G	Power steering oil	[Engine is running]  ● Steering wheel is being turned.	0 - 1.0V	
47	G	pressure switch	[Engine is running]  ■ Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)	
48	В	ECM ground	[Engine is running]  ● Idle speed	Engine ground	
40		Electronic controlled	[Engine is running]  ● Idle speed	0 - 1.0V	
49	W	engine mount-1	[Engine is running]  ● Except the above	BATTERY VOLTAGE (11 - 14V)	
	W/D	Electronic controlled	[Engine is running]  ● Idle speed	BATTERY VOLTAGE (11 - 14V)	
50	W/R	engine mount-2	[Engine is running]  ● Except the above  0 - 1.0V	0 - 1.0V	
51	PU	A/C cut signal	[Engine is running]  ● Air conditioner is operating.	0 - 0.5V	
52	W/G	Electrical load signal	<ul><li>[Engine is running]</li><li>● Rear window defogger: ON</li><li>● Hi-beam headlamp: ON</li></ul>	BATTERY VOLTAGE (11 - 14V)	
			[Engine is running]  • Electrical load: OFF	ov	
	CV/I	Throttle position switch	[Engine is running]  • Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)	
56	GY/L	(Closed position)	[Engine is running]  • Accelerator pedal depressed	Approximately 0V	
57	В	ECM ground	[Engine is running]  ● Idle speed	Engine ground	
58	В	Sensors' ground	[Engine is running]  ■ Warm-up condition  ■ Idle speed	Approximately 0V	
60	BR/W	A/T diagnosis commu- nication line	[Engine is running]  ● Idle speed	Approximately 0 - 2.0V Output voltage fluctuates periodically.	
61	W	Mass air flow sensor	[Engine is running]  • Warm-up condition  • Idle speed	1.2 - 1.8V	
01	VV	INIASS AII IIUW SETISUI	[Engine is running]  ■ Warm-up condition  ■ Engine speed is 2,500 rpm.	1.6 - 2.2V	

		,	•	
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	w	Heated oxygen sensor 1 (front) (B2)	[Engine is running]  ■ Warm-up condition  ■ Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  (V) 1 0.5 0 SEF059V
63	w	Heated oxygen sensor 1 (front) (B1)	[Engine is running]  ■ Warm-up condition  ■ Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  (V) 1 0.5 0 1 s
64	Y/G	Intake air temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
65 75	w w	Crankshaft position sensor (REF)	[Engine is running]  ■ Warm-up condition  ■ Idle speed	Approximately 2.3V★ (AC voltage)  (V) 20 10 0  10 ms  SEF581X
66 76	w w	Camshaft position sensor (PHASE)	[Engine is running]  ■ Warm-up condition  ■ Idle speed	Approximately 4.2V* (AC voltage)  (V) 40 20 0  10 ms  SEF582X
67	W/L	Power supply for ECM (Buck-up)	[Ignition switch "OFF"]	BATTERY VOLTAGE (11 - 14V)
68	BR	A/T signal No. 1	[Engine is running]  ● Idle speed	Approximately 0 - 5V Output voltage fluctuates peri- odically.
69	GY	Data link connector	[Ignition switch "ON"]  ● CONSULT-II is turned "ON".	Approximately 0V
70	Y	Engine coolant temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.

ECM Terminals and Reference Value (Cont'd)

			Low reminar	nais and Reference value (Cont a)	
TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)	
71	W	Heated oxygen sensor 2 (rear) (B2)	[Engine is running]  • Warm-up condition  • Engine speed is 2,000 rpm.	0 - Approximately 1.0V	
72	W	Heated oxygen sensor 2 (rear) (B1)	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed is 2,000 rpm.</li></ul>	0 - Approximately 1.0V	
73	В	Mass air flow sensor ground	[Engine is running]  ■ Warm-up condition  ■ Idle speed	Approximately 0V	
			[Ignition switch "ON"]	Less than 4.5V	
74	SB	EGR temperature sensor	[Engine is running]  ■ Warm-up condition  ■ EGR system is operating.	0 - 1.5V	
77	GY	A/T signal No. 2	[Engine is running]  ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.	
78	OR	A/T signal No. 4	[Engine is running]  ● Idle speed	Approximately 0 - 5V Output voltage fluctuates periodically.	
80	W	Absolute pressure sensor	[Ignition switch "ON"]	Approximately 4.4V	
81	W	Refrigerant pressure sensor	[Engine is running]  • Warm-up condition  • Both A/C switch and blower switch are "ON". (Compressor operates.)	0.36 - 3.88V	
82	W	Throttle position sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Accelerator pedal fully released</li></ul>	Approximately 0.4V	
		signal output	[Ignition switch "ON"]  • Accelerator pedal fully depressed	Approximately 4V	
25	W	Crankshaft position	[Engine is running]  ● Idle speed	Approximately 2.4V  (V) 10 5 0	
85	W	sensor (POS)	[Engine is running]  ● Engine speed is 2,000 rpm.	Approximately 2.3V  (V) 10 5 0 0.4 ms  SEF058V	

ECM Terminals and Reference Value (Cont'd)

TERMI- NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
	D/I	Vehicle greed concer	[Engine is running]  ■ Jack up front wheels.  ■ In 1st gear position  ■ 10 km/h (6 MPH)	Approximately 2.5V  (V) 10 5 0 100 ms  SEF583X
86	P/L	Vehicle speed sensor	[Engine is running]  ■ Jack up front wheels.  ■ In 2nd gear position  ■ 30 km/h (19 MPH)	Approximately 2.0V  (V) 10 5 0 100 ms  SEF584X
91	L/W	Throttle position sensor	<ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Accelerator pedal fully released</li></ul>	0.15 - 0.85V
			Warm-up condition     Accelerator pedal fully released  [Ignition switch "ON"]     Accelerator pedal fully depressed  erature  [Engine is running]  0.15 - 0  3.5 - 4.7	3.5 - 4.7V
92	P/L	Fuel tank temperature sensor	[Engine is running]	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
93	W	Knock sensor	[Engine is running]  ● Idle speed	Approximately 2.5V
95	BR	Data link connector	[Ignition switch "ON"]  ● CONSULT-II is turned "ON".	Approximately 0V
101 102 103 104 105 107	R/B L/W R/W PU/R R/Y R/L	Injector No. 1 Injector No. 5 Injector No. 2 Injector No. 6 Injector No. 3 Injector No. 4	[Engine is running]  ● Idle speed	BATTERY VOLTAGE (11 - 14V)
106 108	ВВ	ECM ground	[Engine is running]  ● Idle speed	Engine ground
110 112	R/G R/G	Power supply for ECM	[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	R	Sensors' power supply	[Ignition switch "ON"]	Approximately 5V
115	OR	Data link connector	[Ignition switch "ON"]  ■ CONSULT-II is turned "ON".	Approximately 2 - 11V

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

#### **Description**

The specification (SP) value indicates the tolerance of the value that is displayed in "DATA MONITOR (SPEC)" mode of CONSULT-II during normal operation of the Engine Control System. When the value in "DATA MONITOR (SPEC)" mode is within the SP value, the Engine Control System is confirmed OK. When the value in "DATA MONITOR (SPEC)" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.

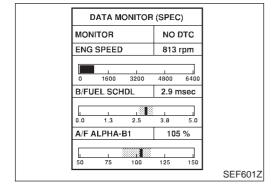
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

#### **Testing Condition**

NFEC0868

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 104.3 kPa (1.003 1.064 kg/cm², 14.25 15.12 psi)
- Atmospheric temperature: 20 30°C (68 86°F)
- Engine coolant temperature: 75 95°C (167 203°F)
- Transmission: Warmed-up\*1Electrical load: Not applied\*2
- Engine speed: Idle
- \*1: For A/T or CVT models, after the engine is warmed up to normal operating temperature, drive vehicle until "FLUID TEMP SE" (A/T or CVT fluid temperature sensor signal) indicates less than 0.9V. For M/T models, drive vehicle for 5 minutes after the engine is warmed up to normal operating temperature.
- \*2: Rear window defogger switch, air conditioner switch, lighting switch are "OFF". Cooling fans are not operating. Steering wheel is straight ahead.



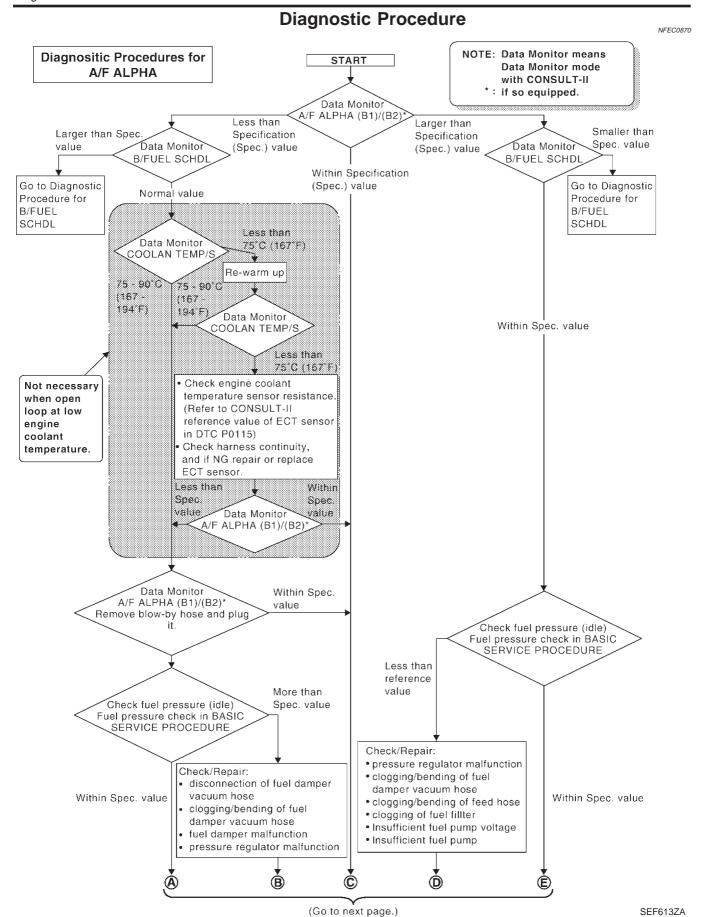
#### **Inspection Procedure**

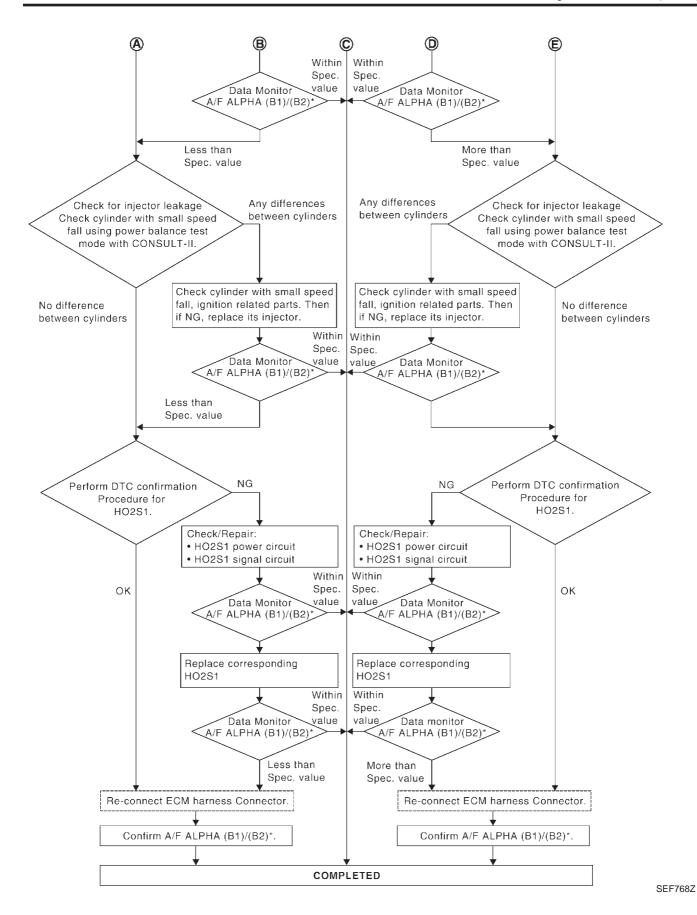
NFEC0869

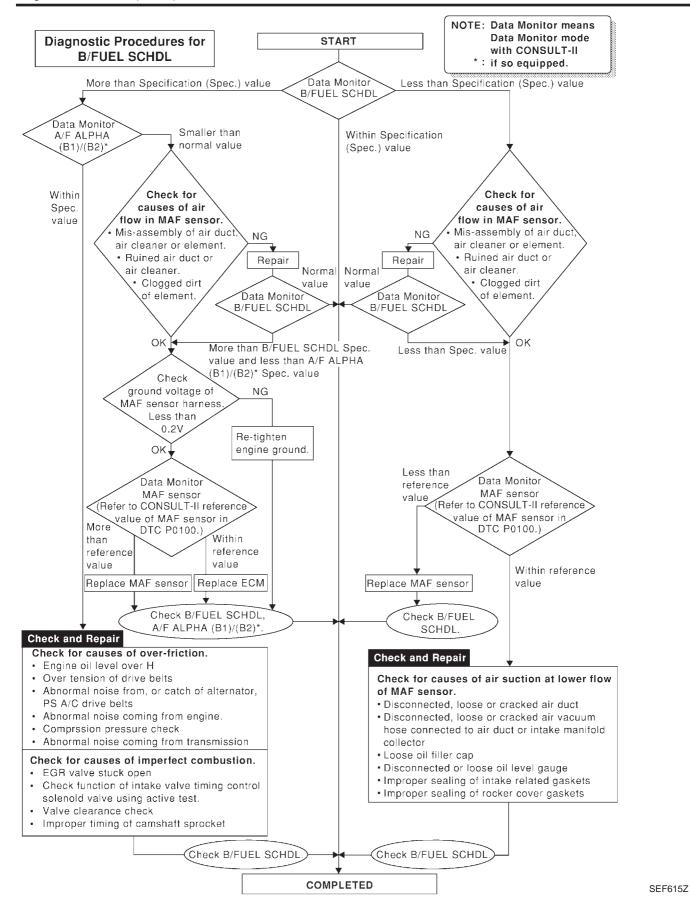
#### NOTE:

Perform "DATA MONITOR (SPEC)" mode in maximum scale display.

- 1. Perform "Basic Inspection", EC-92.
- 2. Confirm that the testing conditions indicated above are met.
- 3. Select "B/FUEL SCHDL", "A/F ALPHA-B1/B2" and "MAS A/F SE-B1" in "DATA MONITOR (SPEC)" mode with CONSULT-II.
- 4. Make sure that monitor items are within the SP value.
- If NG, go to "Diagnostic Procedure", EC-128.







#### TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description

#### **Description**

FFC0654

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

#### **COMMON I/I REPORT SITUATIONS**

NFEC0654S01

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than "0" or "[1t]".
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

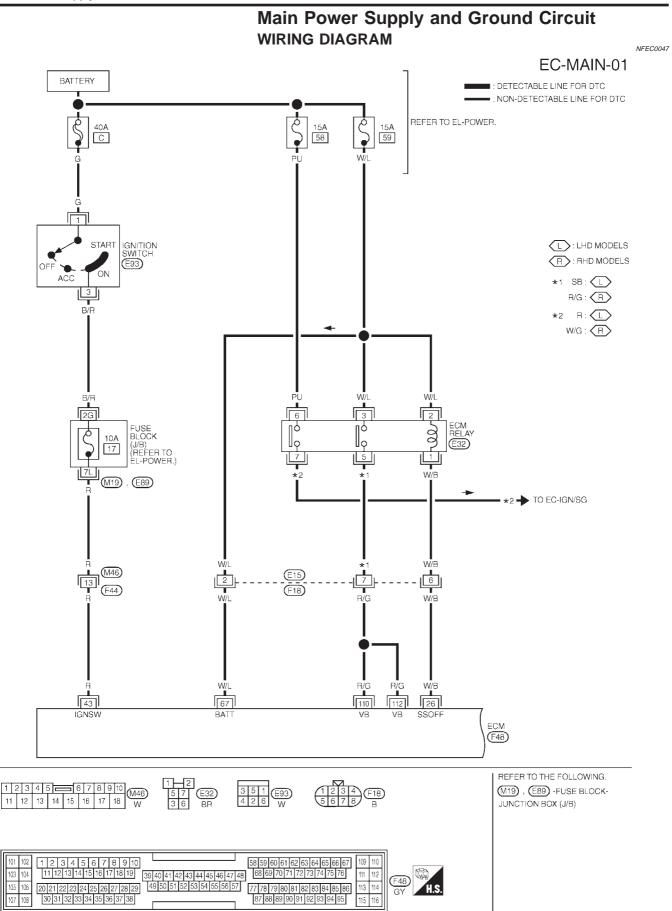
#### **Diagnostic Procedure**

NEEC0655

1	INSPECTION START	
Erase	(1st trip) DTCs. Refer to "H	How to Erase Emission-related Diagnostic Information", EC-57, EC-60.
	<b>&gt;</b>	GO TO 2.

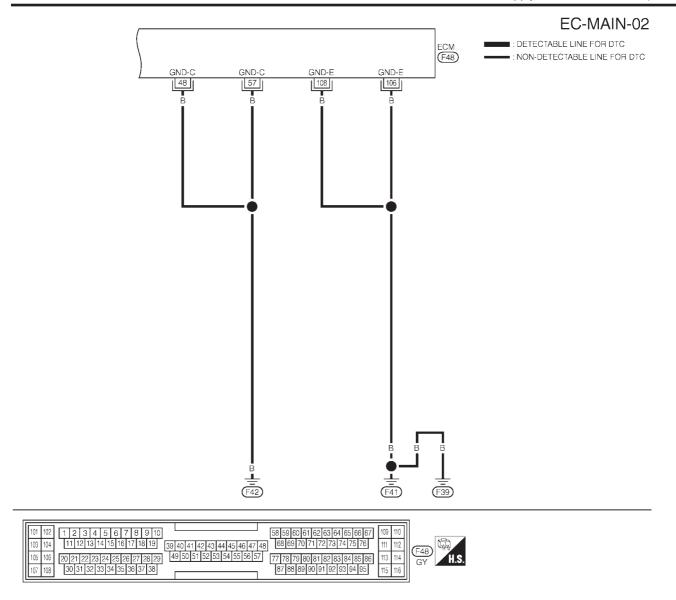
2	CHECK GROUND TERM	MINALS
	eck ground terminals for corroding or loose connection. er to GI-29, "GROUND INSPECTION".	
	OK or NG	
OK	<b>•</b>	GO TO 3.
NG	<b>•</b>	Repair or replace.

3	SEARCH FOR ELECTRICAL INCIDENT	
Perfor	orm GI-24, "Incident Simulation Tests".	
	OK or NG	
OK	<b>&gt;</b>	INSPECTION END
NG	<b>&gt;</b>	Repair or replace.



MEC834C

Main Power Supply and Ground Circuit (Cont'd)



MEC717C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

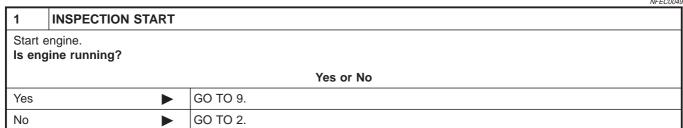
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	W/B	ECM RELAY	ENGINE RUNNING FOR A FEW SECONDS AFTER TURNING IGN OFF	0 - 1.5V
20	***	(SELF-SHUTOFF)	A FEW SECONDS PASSED AFTER TURNING IGN OFF	BATTERY VOLTAGE
43	R	IGN	IGN OFF	ov
40	п	IGN	IGN ON	BATTERY VOLTAGE
48	В	ECM GROUND	ENGINE RUNNING AT IDLE SPEED	ENGINE GROUND
57	В	LOW GITTO THE	ETGINETION BEEGILED	ENGINE GROOMS
67	W/L	POWER SUPPLY (BACK-UP)	IGN OFF	BATTERY VOLTAGE
106	В	ECM GROUND	ENGINE RUNNING AT IDLE SPEED	ENGINE GROUND
108	В	ECIVI GROUND	ENGINE RUNNING AT IDLE SPEED	ENGINE GROUND
110	R/G	POWER SUPPLY FOR ECM	IGN ON	BATTERY VOLTAGE
112	R/G	OVVERTOOT FET FOIT EOW		DATTETH VOLIAGE

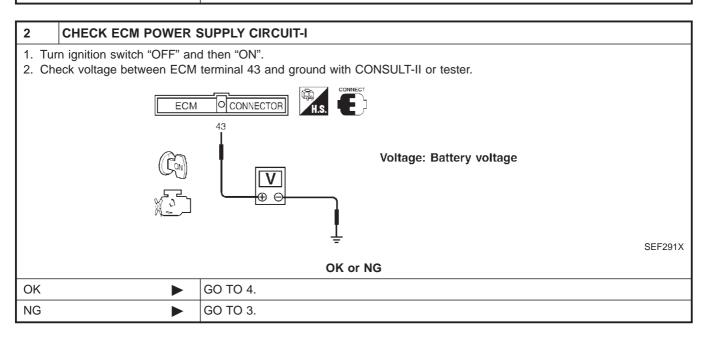
SEF366Z

Main Power Supply and Ground Circuit (Cont'd)

#### **DIAGNOSTIC PROCEDURE**

JEEC.004





#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19, E89
- 10A fuse
- Harness for open or short between ECM and ignition switch
  - Repair harness or connectors.

#### 4 CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminals 48, 57, 106, 108 and engine ground. Refer to WIRING DIAGRAM.

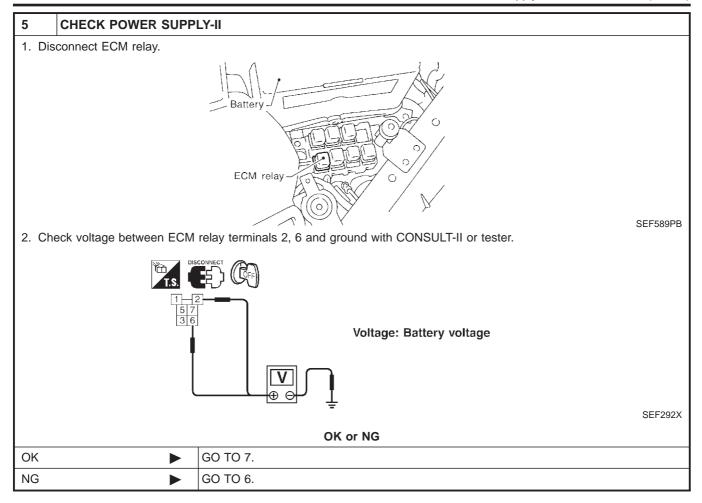
#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

OK J		GO TO 5.
NG	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.

Main Power Supply and Ground Circuit (Cont'd)



#### 6 DETECT MALFUNCTIONING PART

Check the following.

- 15A fuses
- Harness for open or short between ECM relay and battery
  - Repair open circuit or short to ground or short to power in harness or connectors.

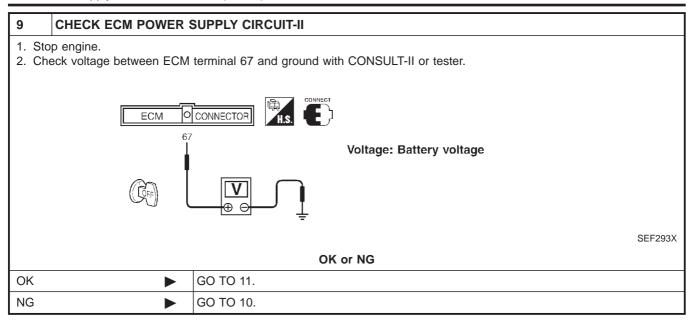
# 7 CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Check harness continuity between ECM terminal 26 and ECM relay terminal 1. Continuity should exist. 2. Also check harness for short to ground and short to power. OK or NG OK (Models with Euro-OBD system) OK (Models without Euro-OBD system) Go to "DTC P1320 IGNITION SIGNAL", EC-391. GO TO 8.

#### 8 DETECT MALFUNCTIONING PART

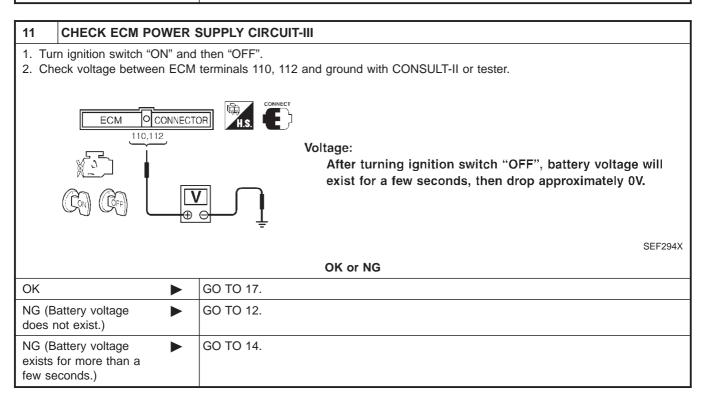
Check the following.

- Harness connectors E15, F18
- Harness for open or short between ECM relay and ECM
  - Repair open circuit or short to ground or short to power in harness or connectors.

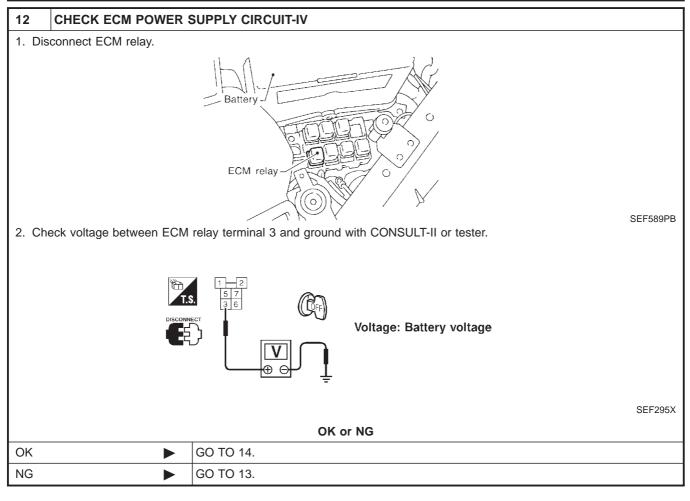
Main Power Supply and Ground Circuit (Cont'd)



# 10 DETECT MALFUNCTIONING PART Check the following. Harness connectors E15, F18 Harness for open or short between ECM and fuse Repair harness or connectors.



Main Power Supply and Ground Circuit (Cont'd)



13	3 DETECT MALFUNCTIONING PART	
	Check the following.  • Harness for open or short between ECM relay and 15A fuse	
	•	Repair open circuit or short to ground or short to power in harness or connectors.

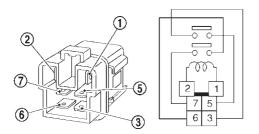
14 CHE	CK HARNESS CO	NTINUITY BETWEEN ECM RELAY AND ECM FOR OPEN AND SH	ORT
Refer to \ Contir	WIRING DIAGRAM nuity should exist.		
		OK or NG	
OK	<b>•</b>	GO TO 16.	
NG	•	GO TO 15.	

15	DETECT MALFUNCTIONING PART		
Check the following.			
	<ul> <li>Harness connectors E15, F18</li> <li>Harness for open or short between ECM and ECM relay</li> </ul>		
Repair open circuit or short to ground or short to power in harness or connectors.			

Main Power Supply and Ground Circuit (Cont'd)

#### 16 CHECK ECM RELAY

- 1. Apply 12V direct current between ECM relay terminals 1 and 2.
- 2. Check continuity between relay terminals 3 and 5, 6 and 7.



Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

SEF296X

#### OK or NG

OK •	GO TO 17.
NG ▶	Replace ECM relay.

#### 17 CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminals 48, 57, 106, 108 and engine ground. Refer to WIRING DIAGRAM.

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

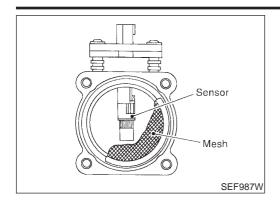
#### OK or NG

OK ►	GO TO 18.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

18	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

#### DTC P0100 MASS AIR FLOW SENSOR (MAFS)

Component Description



#### **Component Description**

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot wire that is supplied with electric current from the ECM. The temperature of the hot wire is controlled by the ECM a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.

#### **CONSULT-II Reference Value in Data Monitor** Mode

Specification data are reference values.

NFEC0051

MONITOR ITEM	CONDITION		SPECIFICATION	
MAS A/F SE-B1	<ul> <li>Engine: After warming up</li> <li>Air conditioner switch: "OFF"</li> <li>Shift lever: "N"</li> <li>No-load</li> </ul>	Idle	1.2 - 1.8V	
MAS A/F SE-B1		2,500 rpm	1.6 - 2.2V	
CAL/LD VALUE	ditto	Idle	14.0 - 33.0%	
CAL/LD VALUE		2,500 rpm	12.0 - 25.0%	
MASS AIRFLOW	ditto	Idle	2.0 - 6.0 g·m/s	
WASS AIRFLOW	uitto	2,500 rpm	7.0 - 20.0 g·m/s	

#### On Board Diagnosis Logic

NFEC0053

Malfunction is detected when

(Malfunction A) an excessively high voltage from the sensor is sent to ECM when engine is not running,

(Malfunction B) an excessively low voltage from the sensor is sent to ECM when engine is running,

(Malfunction C) a voltage from the sensor is constantly approx. 1.0V when engine is running.

#### **FAIL-SAFE MODE**

When the malfunction B is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode	
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	

# Possible Cause MALFUNCTION A

NFEC0426

NFEC0426S01

- Harness or connectors (The sensor circuit is open or shorted.)
- Mass air flow sensor

#### MALFUNCTION B OR C

NFEC0426502

- Harness or connectors (The sensor circuit is open or shorted.)
- Intake air leaks
- Mass air flow sensor

#### **DTC Confirmation Procedure**

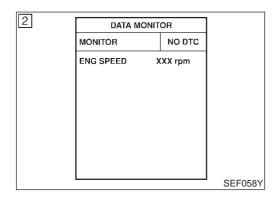
NFEC0054

Perform "PROCEDURE FOR MALFUNCTION A" first.

If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND C".

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.



#### PROCEDURE FOR MALFUNCTION A

NFEC0054S01

- (P) With CONSULT-II
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Wait at least 6 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-143.
- With GST

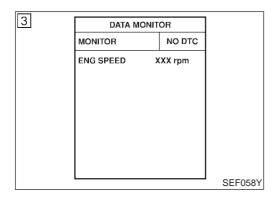
NFEC0054S0103

Follow the procedure "With CONSULT-II" above.

No Tools

NFEC0054S0102

- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-143.



#### PROCEDURE FOR MALFUNCTION B AND C

NFEC0054S02

(P) With CONSULT-II

NFEC0054S0201

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and wait 5 seconds at most.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-143.

#### **With GST**

NFEC0054S0203

Follow the procedure "With CONSULT-II" above.

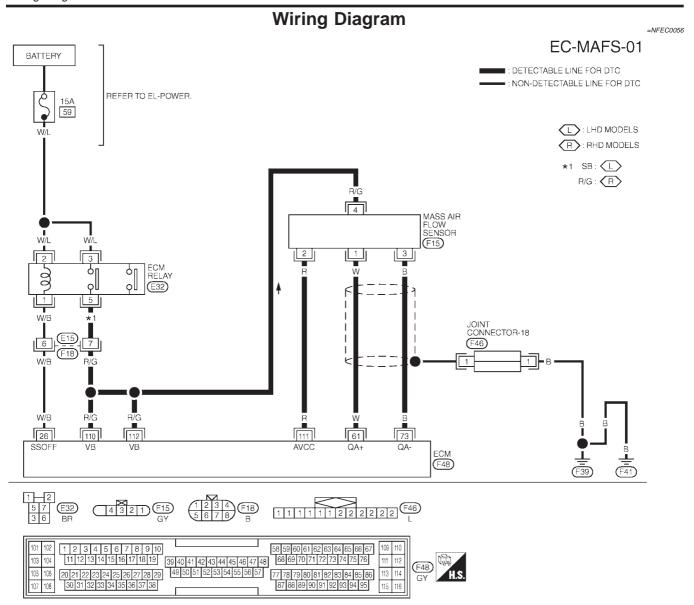
#### DTC P0100 MASS AIR FLOW SENSOR (MAFS)

DTC Confirmation Procedure (Cont'd)

#### No Tools

NFEC0054S0202

- 1) Start engine and wait 5 seconds at most.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-143.



MEC835C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
61			ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	1.2 - 1.8V
61		ENGINE RUNNING AT 2,500 RPM UNDER WARM-UP CONDITION	1.6 - 2.2V	
73	В	MASS AIR FLOW SENSOR GROUND	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 0V
111	R	SENSORS' POWER SUPPLY	IGN ON	APPROX. 5V

SEF650XB

# DTC P0100 MASS AIR FLOW SENSOR (MAFS)

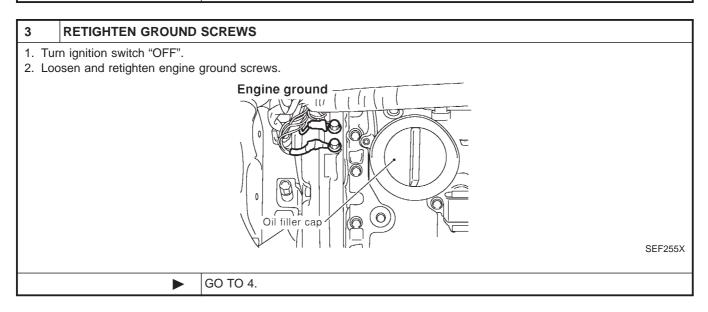
Diagnostic Procedure

# **Diagnostic Procedure**

=NFFC005

1	INSPECTION START				
Whic	h malfunction (A, B or C) is	duplicated?			
		MALFUNCTION	Туре	-	
		A	I		
		B and/or C	II	_	
				MTBL0399	
		Type I or	Гуре II		
Туре	I <b>•</b>	GO TO 3.			
Туре	II <b>&gt;</b>	GO TO 2.			

2	CHECK INTAKE SYSTEM			
• Air • Vac	Check the following for connection.  • Air duct  • Vacuum hoses  • Intake air passage between air duct to intake manifold collector			
	OK or NG			
OK	OK ▶ GO TO 3.			
NG	<b>&gt;</b>	Reconnect the parts.		

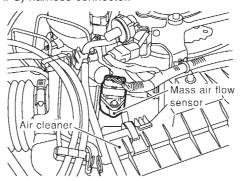


#### DTC P0100 MASS AIR FLOW SENSOR (MAFS)

Diagnostic Procedure (Cont'd)

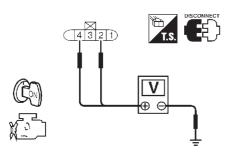
#### CHECK MAFS POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor (MAFS) harness connector.



SEF256X

- 2. Turn ignition switch "ON".
- 3. Check voltage between MAFS terminals 2, 4 and ground with CONSULT-II or tester.



Terminal	Voltage
2	Approximately 5
4	Battery voltage

SEF297X

#### OK or NG

OK •	GO TO 6.
NG ▶	GO TO 5.

#### 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM
  - Repair harness or connectors.

#### 6 CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between MAFS terminal 3 and ECM terminal 73. Refer to Wiring Diagram.

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

OK •	GO TO 7.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

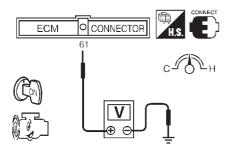
# DTC P0100 MASS AIR FLOW SENSOR (MAFS)

Diagnostic Procedure (Cont'd)

7	7 CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT			
Check harness continuity between MAFS terminal 1 and ECM terminal 61.     Refer to Wiring Diagram.     Continuity should exist.      Also check harness for short to ground and short to power.				
	OK or NG			
OK ▶ GO TO 8.				
NG	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.		

# 8 CHECK MASS AIR FLOW SENSOR

- 1. Reconnect harness connectors disconnected.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Check voltage between ECM terminal 61 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch "ON" (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

SEF298X

4. If the voltage is out of specification, disconnect MAFS harness connector and connect it again. Then repeat above check.

#### OK or NG

OK ►	GO TO 9.
NG ►	Replace mass air flow sensor.

#### 9 CHECK MAFS SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect joint connector-18.
- 3. Check the following.
- Continuity between joint connector terminal 1 and ground Refer to Wiring Diagram.
- Joint connector-18

(Refer to EL-319, "HARNESS LAYOUT".)

# Continuity should exist.

- 4. Also check harness for short to ground and short to power.
- 5. Then reconnect joint connector-18.

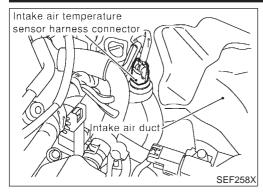
#### OK or NG

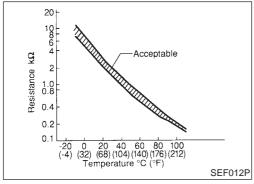
OK ►	GO TO 10.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

10	10 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131		
► INSPECTION END			

# DTC P0110 INTAKE AIR TEMPERATURE SENSOR

#### Component Description





# **Component Description**

NFEC065

The intake air temperature sensor is mounted to the air duct housing. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

#### <Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.1 - 2.9
80 (176)	1.23	0.27 - 0.38

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

# On Board Diagnosis Logic

NFEC0657

Malfunction is detected when

(Malfunction A) an excessively low or high voltage from the sensor is sent to ECM,

(Malfunction B) rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.

# **Possible Cause**

NFEC0658

- Harness or connectors (The sensor circuit is open or shorted.)
- Intake air temperature sensor

# **DTC Confirmation Procedure**

NFEC065

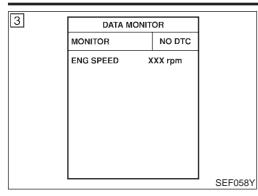
Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".

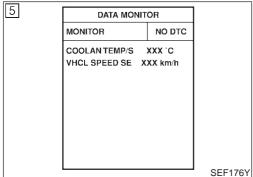
#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

# DTC P0110 INTAKE AIR TEMPERATURE SENSOR

DTC Confirmation Procedure (Cont'd)





## PROCEDURE FOR MALFUNCTION A

# (P) With CONSULT-II

NFEC0659S0101

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Wait at least 5 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-149.

# **With GST**

Follow the procedure "With CONSULT-II" above.

NFEC0659S0102

NFEC0659S02

NFEC0659S01

#### PROCEDURE FOR MALFUNCTION B

**CAUTION:** 

Always drive vehicle at a safe speed.

#### **TESTING CONDITION:**

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

#### (P) With CONSULT-II

NEEC0659S0201

- 1) Wait until engine coolant temperature is less than 90°C (194°F).
- a) Turn ignition switch "ON".
- b) Select "DATA MONITOR" mode with CONSULT-II.
- c) Check the engine coolant temperature.
- d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 2) Turn ignition switch "ON".
- 3) Select "DATA MONITOR" mode with CONSULT-II.
- 4) Start engine.
- 5) Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-149.

# **With GST**

Follow the procedure "With CONSULT-II" above.

NFEC0659S0202

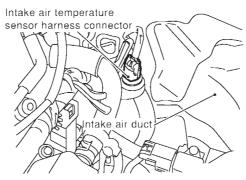
# **Wiring Diagram** NFEC0660 EC-IATS-01 INTAKE AIR TEMPERATURE SENSOR (E12) ■ : DETECTABLE LINE FOR DTC $\langle W \rangle$ -: NON-DETECTABLE LINE FOR DTC A: WITH A/T : LHD MODELS R: RHD MODELS 2: (L) 3: R 6 : CL 8: R 58 GND-A 42 TCM (TRANSMISSION CONTROL MODULE) (F50): (A) SENS GND (F48) 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 49 50 51 52 53 54 55 56 57 MEC991C

# **Diagnostic Procedure**

NFEC0661

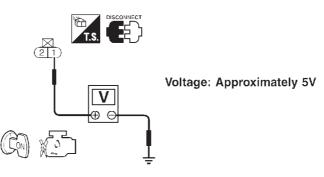
# 1 CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect intake air temperature sensor harness connector.



3. Turn ignition switch "ON".

4. Check voltage between terminal 1 and ground.



OK or NG

SEF301X

SEF258X

OK	<b>&gt;</b>	GO TO 3.
NG	<b>•</b>	GO TO 2.

## 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F17
- Harness for open or short between ECM and intake air temperature sensor

Repair harness or connectors.

# 3 CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK	or	Ν	G
----	----	---	---

OK ►	GO TO 5.
NG ▶	GO TO 4.

# DTC P0110 INTAKE AIR TEMPERATURE SENSOR

Diagnostic Procedure (Cont'd)

# 4 DETECT MALFUNCTIONING PART

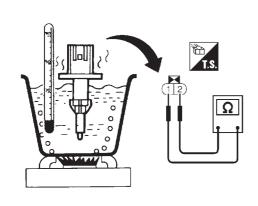
Check the following.

- Harness connectors E8, F17
- Harness for open or short between ECM and intake air temperature sensor
- Harness for open or short between TCM (Transmission Control Module) and intake air temperature sensor

Repair open circuit or short to ground or short to power in harness or connectors.

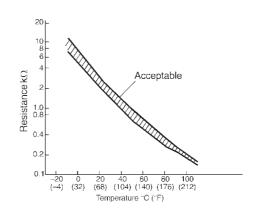
# 5 CHECK INTAKE AIR TEMPERATURE SENSOR

Check resistance between intake air temperature sensor terminals 1 and 2 as shown in the figure.



#### <Reference data>

Temperature °C (°F)	Resistance k $\Omega$	
20 (68)	2.1 - 2.9	
80 (176)	0.27 - 0.38	



SEF302X

# OK or NG

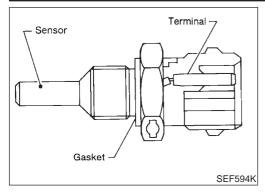
OK J	<b>\</b>	GO TO 6.
NG		Replace intake air temperature sensor.

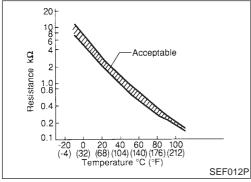
#### 6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.

► INSPECTION END

Component Description





# **Component Description**

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

#### <Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 70 (Engine coolant temperature sensor) ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

# On Board Diagnosis Logic

NFEC007

Malfunction is detected when an excessively high or low voltage from the sensor is sent to ECM.

# **FAIL-SAFE MODE**

NFEC0070S

When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

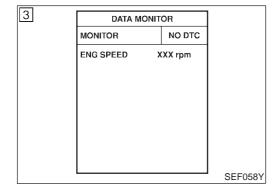
Detected items	Engine operating condition in fail-safe mode		
	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".  CONSULT-II displays the engine coolant temperature decided by ECM.		
Engine coolant tem-	Condition	Engine coolant temperature decided (CONSULT-II display)	
perature sensor circuit	Just as ignition switch is turned ON or Start	40°C (104°F)	
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)	
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)	

Possible Cause

# **Possible Cause**

NFEC0429

- Harness or connectors (The sensor circuit is open or shorted.)
- Engine coolant temperature sensor



# **DTC Confirmation Procedure**

NFEC0071

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

# (P) WITH CONSULT-II

NFEC0071S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Wait at least 5 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-154.

## **WITH GST**

NFEC0071S03

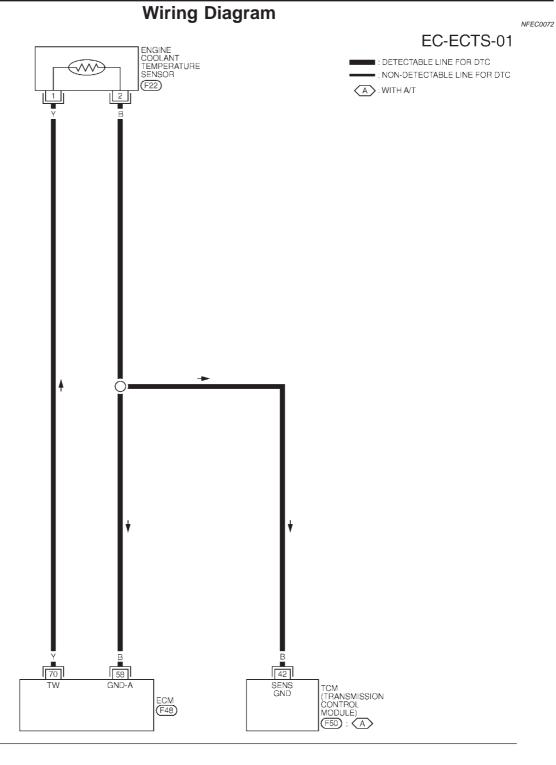
Follow the procedure "WITH CONSULT-II" above.

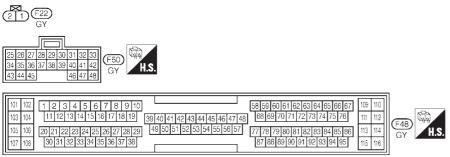
# NO TOOLS

NFEC0071S02

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-154.

Wiring Diagram





MEC721C

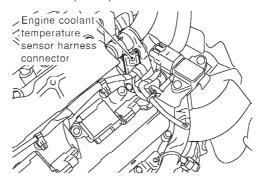
Diagnostic Procedure

# **Diagnostic Procedure**

NFEC0073

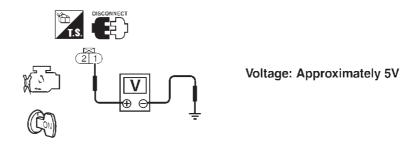
# 1 CHECK ECTS POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect engine coolant temperature sensor (ECTS) harness connector.



SEF259X

- 3. Turn ignition switch "ON".
- 4. Check voltage between ECTS terminal 1 and ground with CONSULT-II or tester.



SEF585X

OK	or	NG
----	----	----

OK ►	GO TO 2.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

## 2 CHECK ECTS GROUND CIRCUIT FOR OPEN AND CIRCUIT

- 1. Turn ignition switch "OFF".
- Check harness continuity between ECTS terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

ΩK	or	NG

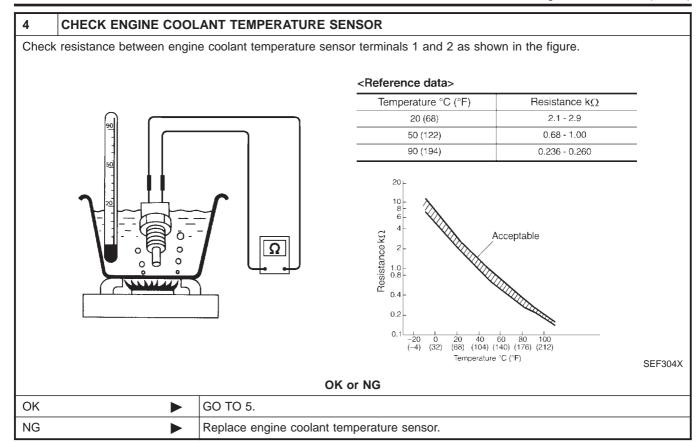
ОК	<b>&gt;</b>	GO TO 4.
NG	<b>•</b>	GO TO 3.

## 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between TCM (Transmission Control Module) and engine coolant temperature sensor
  - Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)



5	5 CHECK INTERMITTENT INCIDENT		
Re	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	<b>•</b>	INSPECTION END	

# **Description**

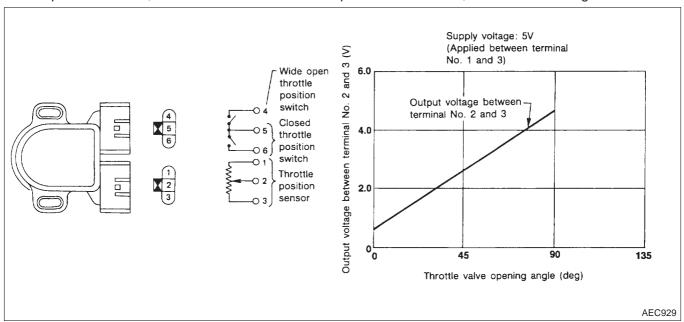
#### COMPONENT DESCRIPTION

NFEC0074

NFEC0074S01

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This sensor controls engine operation such as fuel cut. On the other hand, the "Wide open and closed throttle position switch", which is built into the throttle position sensor unit, is not used for engine control.



# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

NFEC0075

MONITOR ITEM	CONDITION		SPECIFICATION
	Engine: After warming up, idle the engine	Throttle valve: fully closed	0.15 - 0.85V
THRTL POS SEN	<ul><li>Engine: After warming up</li><li>Ignition switch: ON (Engine stopped)</li></ul>	Throttle valve: fully opened	3.5 - 4.7V
	Engine: After warming up, idle the engine	Throttle valve: fully closed	0.0%
ABSOL TH-P/S	<ul><li>Engine: After warming up</li><li>Ignition switch: ON (Engine stopped)</li></ul>	Throttle valve: fully opened	Approx. 80%

On Board Diagnosis Logic

# On Board Diagnosis Logic

Malfunction is detected when an excessively low or high voltage from the sensor is sent to ECM.

# **FAIL-SAFE MODE**

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode		
	Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.		
Throttle position sensor	Condition	Driving condition	
circuit	When engine is idling	Normal	
	When accelerating	Poor acceleration	

# **Possible Cause**

NFEC0430

- Harness or connectors (The throttle position sensor circuit is open or shorted.)
- Throttle position sensor

# **DTC Confirmation Procedure**

NOTE:

NFEC0078

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

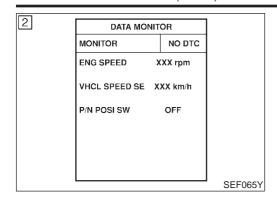
#### **CAUTION:**

Always drive vehicle at a safe speed.

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm that battery voltage is more than 10V at idle.
- This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

DTC Confirmation Procedure (Cont'd)



# (P) WITH CONSULT-II

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- Start engine and maintain the following conditions for at least 5 consecutive seconds.

Vehicle speed	More than 4 km/h (2 MPH)
Selector lever	Suitable position except "P" or "N" position

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

# **WITH GST**

Follow the procedure "WITH CONSULT-II" above.

#### NO TOOLS

1) Start engine and maintain the following conditions for at least 5 consecutive seconds.

Vehicle speed	More than 4 km/h (2 MPH)
Selector lever	Suitable position except "P" or "N" position

- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

# **Wiring Diagram** NFEC0079 EC-TPS-01 THROTTLE POSITION SENSOR ■ : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC A: WITH A/T JOINT CONNECTOR-18 (F46) 111 91 58 42 SENS TCM (TRANSMISSION CONTROL MODULE) ECM F48 (F50) : (A) (F41) 1 1 1 1 1 1 2 2 2 2 2 2 1 F46

34 35 36 37 38 39 40 41 42 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 1 2 3 4 5 6 7 8 9 10 111 112 (F48) 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 105 106 49 50 51 52 53 54 55 56 57 113 114

321 F11 BR

MEC837C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE, DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE EDM OTHER TRANSPORT OF A GROUND OTHER THANK EDM TERMINAZES, OCCUPACITIES GROUND.				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
91	L/W	THROTTLE POSITION	ENGINE RUNNING UNDER WARM-UP CONDITION WITH ACCELERATOR PEDAL FULLY RELEASED	0.15 - 0.85V
		IGN ON WITH ACCELERATOR PEDAL FULLY DEPRESSED	3.5 - 4.7V	
111	R	SENSORS' POWER SUPPLY	IGN ON	APPROX. 5V
58	В	SENSORS' GROUND	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 0V

SEF652XB

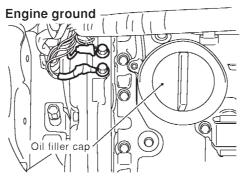
# **Diagnostic Procedure**

NFEC0080



1. Turn ignition switch "OFF".

2. Loosen and retighten engine ground screws.

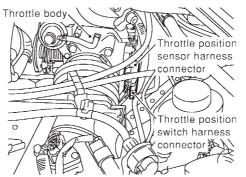


SEF255X

GO TO 2.

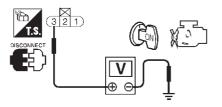
# 2 CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect throttle position sensor harness connector.



SEF260X

- 2. Turn ignition switch "ON".
- 3. Check voltage between throttle position sensor terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF306X

OK or NG

OK •	GO TO 3.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

3	CHECK THROTTLE	POS	SITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT			
2. Ch Re	Turn ignition switch "OFF".     Check harness continuity between sensor terminal 1 and engine ground.     Refer to Wiring Diagram.     Continuity should exist.     Also check harness for short to ground and short to power.					
	OK or NG					
OK	OK ▶ GO TO 5.					
NG	NG GO TO 4.					

4	DETECT MALFUNCTIONING PART		
Check the following.  • Harness for open or short between ECM and throttle position sensor  • Harness for open or short between TCM (Transmission Control Module) and throttle position sensor			
Repair open circuit or short to ground or short to power in harness or connectors.			

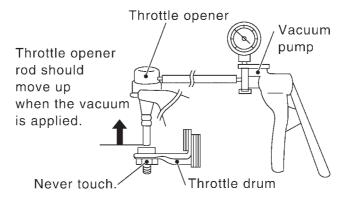
5 CHECK THROTT	LE PO	SITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
<ol> <li>Disconnect ECM harness connector.</li> <li>Check harness continuity between ECM terminal 91 and throttle position sensor terminal 2.         Refer to Wiring Diagram.         Continuity should exist.</li> <li>Also check harness for short to ground and short to power.</li> </ol>			
		OK or NG	
OK (With CONSULT-II)	OK (With CONSULT-II)   GO TO 6.		
OK (Without CONSULT-II)	•	GO TO 7.	
NG	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.	

Diagnostic Procedure (Cont'd)

# 6 CHECK THROTTLE POSITION SENSOR

## With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine (ignition switch OFF).
- 3. Remove the vacuum hose connected to the throttle opener.
- 4. Connect suitable vacuum hose to the vacuum pump and the opener.
- 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

- 6. Turn ignition switch ON.
- 7. Select "DATA MONITOR" mode with CONSULT-II.
- 8. Check voltage of "THRTL POS SEN" under the following conditions.

Voltage measurement must be made with throttle position sensor installed in vehicle.

DATA MONITOR				
;				
XXX V				

Throttle valve conditions	THRTL POS SEN	
Completely closed (a)	0.15 - 0.85V	
Partially open	Between (a) and (b)	
Completely open (b)	3.5 - 4.7V	

SEF062Y

# OK or NG

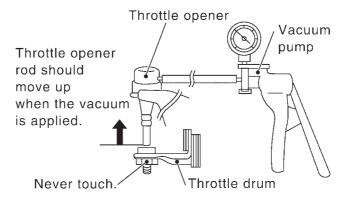
OK ▶	GO TO 9.
NG ▶	GO TO 8.

Diagnostic Procedure (Cont'd)

## CHECK THROTTLE POSITION SENSOR

# Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine (ignition switch OFF).
- 3. Remove the vacuum hose connected to the throttle opener.
- 4. Connect suitable vacuum hose to the vacuum pump and the opener.
- 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

- 6. Turn ignition switch ON.
- 7. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.

  Voltage measurement must be made with throttle position sensor installed in vehicle.

Throttle valve conditions	Voltage
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

MTBL0231

#### OK or NG

OK ►	GO TO 9.
NG ►	GO TO 8.

# 8 ADJUST CLOSED THROTTLE POSITION SWITCH

Adjust closed throttle position switch. Refer to "Basic Inspection", EC-92.

Items	Specifications	
Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)	
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF	
Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)	

MTBL0623

## OK or NG

OK ► GO TO 9.		GO TO 9.
NG	<b>&gt;</b>	Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-92.

Diagnostic Procedure (Cont'd)

OK

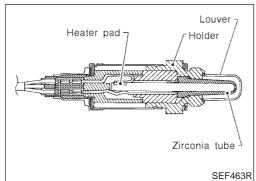
NG

# CHECK THROTTLE POSTION SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch "OFF". 2. Disconnect joint connector-18 3. Check the following • Continuity between joint connector terminal 2 and ground Joint connector (Refer to EL-319, "HARNESS LAYOUT".) Continuity should exist. • Also check harness for short to ground and short to power. • Then reconnect joint connector-18. OK or NG GO TO 10.

10	10 CHECK INTERMITTENT INCIDENT				
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.				
	► INSPECTION END				

Repair open circuit or short to ground or short to to power in harness or connectors.

Component Description



# 

# **Component Description**

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

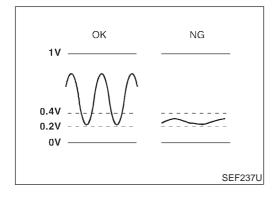
# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

Mixture ratio

SEF288D

MONITOR ITEM	CONE	DITION	SPECIFICATION
HO2S1 (B1) HO2S1 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.



# On Board Diagnosis Logic

Under the condition in which the heated oxygen sensor 1 (front) signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.

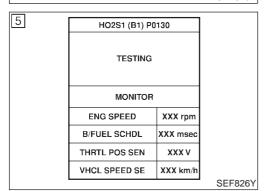
Malfunction is detected when the voltage from the sensor is constantly approx. 0.3V.

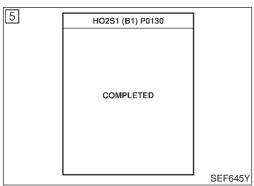
# **Possible Cause**

NFEC0432

- Harness or connectors (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)

5	HO2S1 (B1) P	0130	
	OUT OF CONE	OTION	
	MONITOR	ì	
	ENG SPEED	XXX rpm	
	B/FUEL SCHDL	XXX msec	
	THRTL POS SEN	xxx v	
	VHCL SPEED SE	XXX km/h	
			SEF825\





# **DTC Confirmation Procedure**

NFEC0662

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### IOTF.

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

# (P) WITH CONSULT-II

NFEC0662S01

- 1) Start engine and warm it up to normal operating temperature.
- Select "HO2S1 (B1) P0130/HO2S1 (B2) P0150" of "HO2S1 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 3) Touch "START".
- 4) Let it idle for at least 3 minutes.

#### NOTE

Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.

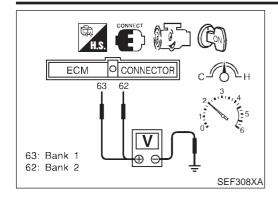
5) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,400 - 2,400 rpm
Vehicle speed	70 - 120 km/h (43 - 75 MPH)
B/FUEL SCHDL	2.0 - 10 msec
Selector lever	Suitable position

# If "TESTING" is not displayed after 5 minutes, retry from step 2.

6) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-170.

Overall Function Check



# **Overall Function Check**

NEECOSS

Use this procedure to check the overall function of the heated oxygen sensor 1 (front) circuit. During this check, a 1st trip DTC might not be confirmed.

# **WITHOUT CONSULT-II**

NEEC066350

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- Check the following with engine speed held at 2,000 rpm constant under no load.
- The voltage does not remain in the range of 0.2 0.4V.
- 4) If NG, go to "Diagnostic Procedure", EC-170.

# Wiring Diagram =NFEC0092 **BANK 1** NFEC0092S01 EC-02S1B1-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) 15A 8 REFER TO EL-POWER. (M19) (M46) HEATED OXYGEN SENSOR 1 (FRONT)(B1) JOINT CONNECTOR-18 F46 (F2) 63 ECM (F48) F41 1 2 3 4 5 6 7 8 9 10 1 1 2 3 4 5 16 17 18 W REFER TO THE FOLLOWING. 1 1 1 1 1 1 2 2 2 2 2 2 2 L M19 -FUSE BLOCK-JUNCTION BOX (J/B) 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 109 110 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 (F48) 20 21 22 23 24 25 26 27 28 29 105 106 49 50 51 52 53 54 55 56 57 77 78 79 80 81 82 83 84 85 86 30 31 32 33 34 35 36 37 38 80 81 82 83 91 92 93 94 95

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

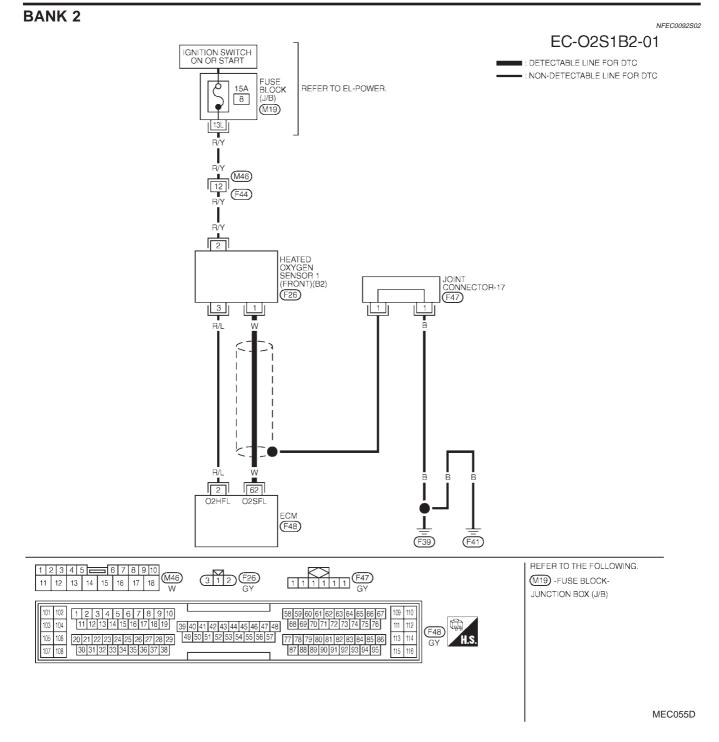
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS. SUCH AS THE GROUND.

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)	
63	1/1/	HEATED OXVGEN	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s	

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MEC054D

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS. SUCH AS THE GROUND

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)	
62	I W		ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s	

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Diagnostic Procedure

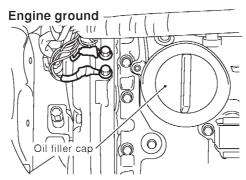
1

# **Diagnostic Procedure**

NFEC0093

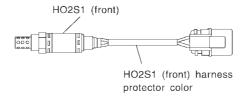
# INSPECTION START

- 1. Turn ignition switch "OFF".
- 2. Loosen and retighten engine ground screws.



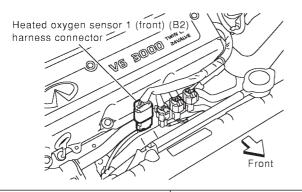
SFF255X

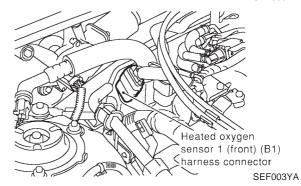
3. Make sure HO2S1 (front) harness protector color, and disconnect corresponding heated oxygen sensor 1 (front) harness connector.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

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GO TO 2.

Diagnostic Procedure (Cont'd)

# 2 CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
	ECM	Sensor	Dalik
P0130	63	1	1
P0150	62	1	2

MTBL0484

## Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank		
DIC	ECM or Sensor	Ground	Dank	
P0130	63 or 1	Ground	1	
P0150	62 or 1	Ground	2	

MTBL0485

#### Continuity should not exist.

4. Also check harness for short to power.

#### OK or NG

OK (With CONSULT-II)	<b>•</b>	GO TO 3.
OK (Without CONSULT-II)	<b>•</b>	GO TO 4.
NG	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

# CHECK HEATED OXYGEN SENSOR 1 (FRONT)

## (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
- 3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-II screen.

DATA MON	ITOR
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	xxx v
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

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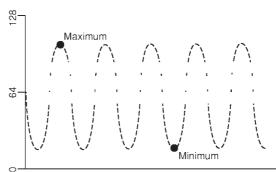
- 6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

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- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

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## **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK	or	NG
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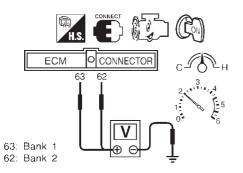
OK •	GO TO 6.
NG ▶	GO TO 5.

Diagnostic Procedure (Cont'd)

# 4 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

# Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

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#### **CAUTION:**

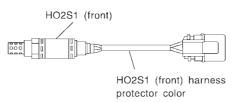
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 6.
NG ▶	GO TO 5.

# REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

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#### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

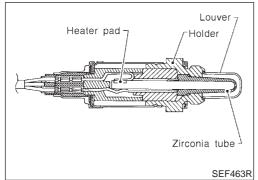
► Replace malfunctioning heated oxygen sensor 1 (front).

Diagnostic Procedure (Cont'd)

#### CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch "OFF". 2. Disconnect joint connector-17 or joint connector-18. 3. Check the following. • Continuity between joint connector terminal 1 or 2 and ground Joint connector (Refer to EL-319, "HARNESS LAYOUT".) Continuity should exist. 4. Also check harness for short to ground and short to power. 5. Then reconnect joint connector-17 or joint connector-18. OK or NG GO TO 7. OK NG Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	<b>&gt;</b>	INSPECTION END	

Component Description



# Nixture ratio SEF288D

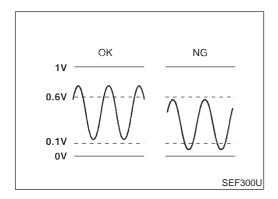
# **Component Description**

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

MONITOR ITEM	CONE	DITION	SPECIFICATION
HO2S1 (B1) HO2S1 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.



# On Board Diagnosis Logic

To judge the malfunction, the output from the heated oxygen sensor 1 (front) is monitored to determine whether the "rich" output is sufficiently high and whether the "lean" output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.

Malfunction is detected when the maximum and minimum voltage from the sensor are not reached to the specified voltages.

# **Possible Cause**

NFEC0667

- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)
- Fuel pressure
- Injectors
- Intake air leaks

# **DTC Confirmation Procedure**

NFEC0668

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

- Always perform at a temperature above –10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.

# (P) WITH CONSULT-II

NFEC0668S01

- 1) Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 10 seconds.
- Turn ignition switch "ON" and select "HO2S1 (B1) P0131/ HO2S1 (B2) P0151" of "HO2S1 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 3 minutes.

#### NOTE:

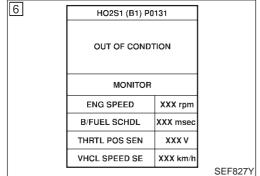
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

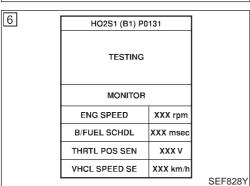
6) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)

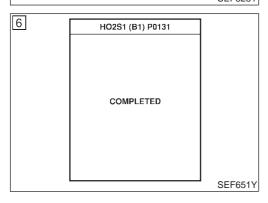
ENG SPEED	1,200 - 2,600 rpm (A/T) 1,800 - 2,600 rpm (M/T)
Vehicle speed	80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL	3 - 9 msec (A/T) 2.5 - 9 msec (M/T)
Selector lever	Suitable position

# If "TESTING" is not displayed after 5 minutes, retry from step 2.

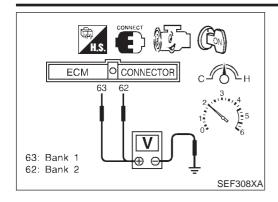
 Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-177.







Overall Function Check



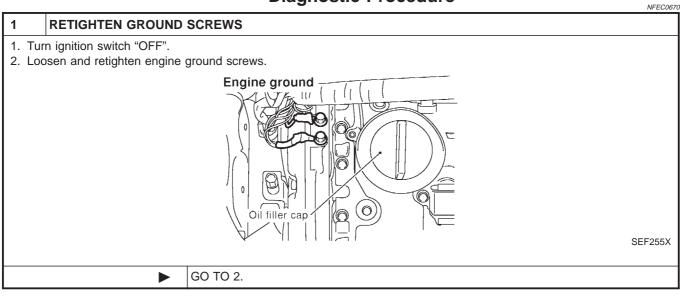
# **Overall Function Check**

Use this procedure to check the overall function of the heated oxygen sensor 1 (front) circuit. During this check, a 1st trip DTC might not be confirmed.

# **WITH GST**

- 1) Start engine and warm it up to normal operating temperature.
- Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- Check one of the following with engine speed held at 2,000 rpm constant under no load.
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is over 0.1V at least one time.
- 4) If NG, go to "Diagnostic Procedure", EC-177.

# **Diagnostic Procedure**



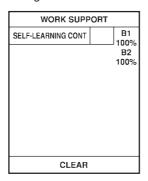
# **RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)** Loosen and retighten corresponding heated oxygen sensor 1 (front). **Tightening torque:** 40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb) GO TO 3.

Diagnostic Procedure (Cont'd)

# 3 CLEAR THE SELF-LEARNING DATA

## (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
- 3. Clear the self-learning control coefficient by touching "CLEAR".



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4. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

# Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure 1st trip DTC P0100 is displayed.
- 6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57.
- 7. Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

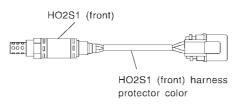
#### Yes or No

Yes	Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-268.
No	GO TO 4.

Diagnostic Procedure (Cont'd)

# CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

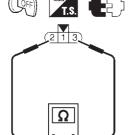
- 1. Stop engine.
- 2. Check heated oxygen sensor 1 (front) harness protector color.

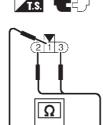


HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

- 3. Disconnect HO2S1 (front) harness connector.
- 4. Check resistance between HO2S1 (front) terminals as follows.





Terminals Resistance	
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2 1 and 3	$\infty\Omega$ (Continuity should not exist.)

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#### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK (With CONSULT-II)		GO TO 5.
OK (Without CONSULT-II)	•	GO TO 6.
NG	<b>•</b>	GO TO 7.

Diagnostic Procedure (Cont'd)

# CHECK HEATED OXYGEN SENSOR 1 (FRONT)

## (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
- 3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR		
MONITOR	NO DTC	
ENG SPEED	XXX rpm	
MAS A/F SE-B1	xxx v	
COOLAN TEMP/S	XXX °C	
HO2S1 (B1)	xxx v	
HO2S1 MNTR (B1)	LEAN	

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- 6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

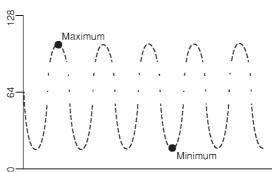
HO2S1 MNTR (B2) R-L-R-L-R-L-R-L-R

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

#### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK	or	NG
----	----	----

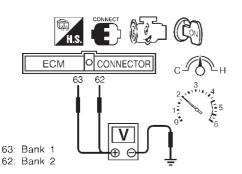
OK •	GO TO 8.
NG ▶	GO TO 7.

Diagnostic Procedure (Cont'd)

### 6 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

SEF039YA

### **CAUTION:**

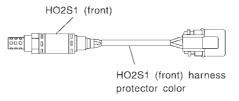
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK •	GO TO 8.
NG ▶	GO TO 7.

### REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

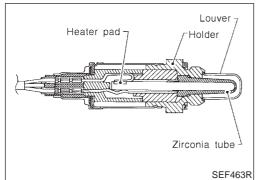
► Replace malfunctioning heated oxygen sensor 1 (front).

Diagnostic Procedure (Cont'd)

8	CHECK HEATED OXYG	SEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT	
1. Tui	rn ignition switch "OFF".		
2. Dis	sconnect joint connector-17	or joint connector-18.	
3. Fo	r circuit, refer to "DTC P013	30/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-165.	
4. Ch	eck the following.		
• Coi	ntinuity between joint conne	ector terminal 1 or 2 and ground	
<ul><li>Joir</li></ul>	nt connector		
(Re	(Refer to EL-319, "HARNESS LAYOUT".)		
	Continuity should exist.		
5. Also check harness for short to ground and short to power.			
6. Then reconnect joint connector-17 or joint connector-18.			
OK or NG			
OK	<b>&gt;</b>	GO TO 9.	
NG Repair open circuit or short to ground or short to power in harness or connectors.			

9	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131. For circuit, refer to "DTC P0130/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-165.		
	<b>•</b>	INSPECTION END

Component Description



# 

### **Component Description**

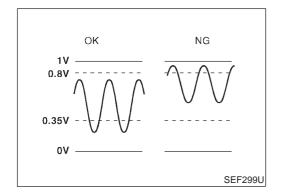
The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

SEF288D

MONITOR ITEM	CONE	DITION	SPECIFICATION
HO2S1 (B1) HO2S1 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.



### On Board Diagnosis Logic

To judge the malfunction, the output from the heated oxygen sensor 1 (front) is monitored to determine whether the "rich" output is sufficiently high. The "lean" output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.

Malfunction is detected when the maximum and minimum voltages from the sensor are beyond the specified voltages.

### **Possible Cause**

NFEC0674

- Heated oxygen sensor 1 (front)
- Fuel pressure
- Injectors
- Heated oxygen sensor 1 heater (front)

### **DTC Confirmation Procedure**

NFEC0675

### **CAUTION:**

Always drive vehicle at a safe speed.

### NOTE

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

- Always perform at a temperature above –10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

### (P) WITH CONSULT-II

NFEC0675S01

- 1) Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "HO2S1 (B1) P0132/ HO2S1 (B2) P0152" of "HO2S1 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 3 minutes.

### NOTE:

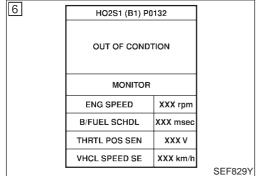
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

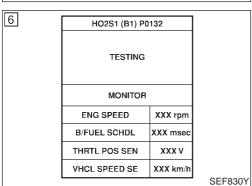
6) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)

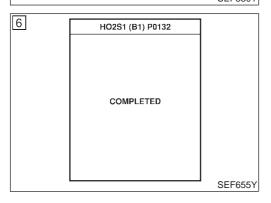
ENG SPEED	1,200 - 2,600 rpm (A/T) 1,800 - 2,600 rpm (M/T)
Vehicle speed	80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL	3 - 9 msec (A/T) 2.5 - 9 msec (M/T)
Selector lever	Suitable position

## If "TESTING" is not displayed after 5 minutes, retry from step 2.

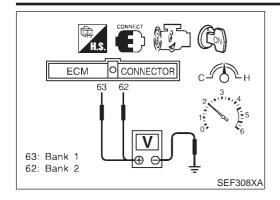
 Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-185.







Overall Function Check



### **Overall Function Check**

NEECOST

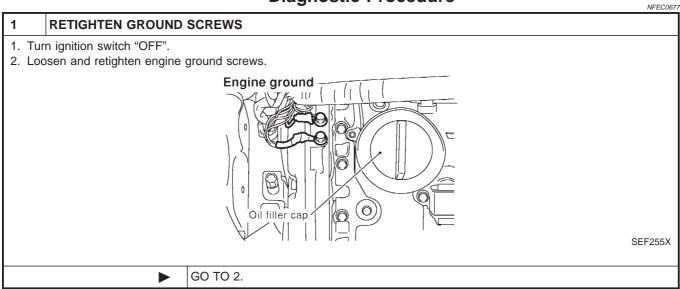
Use this procedure to check the overall function of the heated oxygen sensor 1 (front) circuit. During this check, a 1st trip DTC might not be confirmed.

### **WITH GST**

NFFC06765

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- 3) Check one of the following with engine speed held at 2,000 rpm constant under no load.
- The maximum voltage is below 0.8V at least one time.
- The minimum voltage is below 0.35V at least one time.
- 4) If NG, go to "Diagnostic Procedure", EC-185.

### **Diagnostic Procedure**



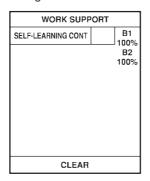
# 2 RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT) Loosen and retighten corresponding heated oxygen sensor 1 (front). Tightening torque: 40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb) GO TO 3.

Diagnostic Procedure (Cont'd)

### 3 CLEAR THE SELF-LEARNING DATA

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
- 3. Clear the self-learning control coefficient by touching "CLEAR".



SEF652Y

4. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected?

Is it difficult to start engine?

### **⋈** Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure 1st trip DTC P0100 is displayed.
- 6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57.
- 7. Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected?

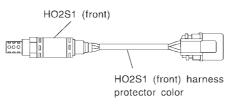
Is it difficult to start engine?

### Yes or No

Yes ▶	Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-276.	
No ►	GO TO 4.	

### 4 CHECK HEATED OXYGEN SENSOR (FRONT) CONNECTOR FOR WATER

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

- 3. Disconnect heated oxygen sensor 1 (front) harness connector.
- 4. Check connectors for water.

Water should not exist.

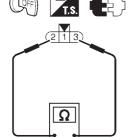
### OK or NG

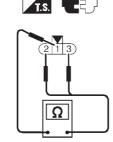
OK	•	GO TO 5.
NG	•	Repair or replace harness or connectors.

Diagnostic Procedure (Cont'd)

### CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.





Terminals	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2 1 and 3	$\infty\Omega$ (Continuity should not exist.)

SEF310X

### **CAUTION:**

5

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK (With CONSULT-II)	<b>&gt;</b>	GO TO 6.
OK (Without CONSULT-II)	<b>&gt;</b>	GO TO 7.
NG	<b>&gt;</b>	GO TO 8.

Diagnostic Procedure (Cont'd)

### CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
- 3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR				
MONITOR NO DTC				
ENG SPEED	XXX rpm			
MAS A/F SE-B1	xxx v			
COOLAN TEMP/S	XXX °C			
HO2S1 (B1)	xxx v			
HO2S1 MNTR (B1)	LEAN			

SEF646Y

- 6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

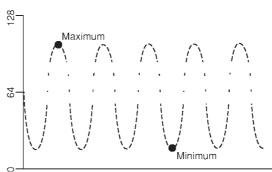
HO2S1 MNTR (B2) R-L-R-L-R-L-R-L-R

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK	or	NG
----	----	----

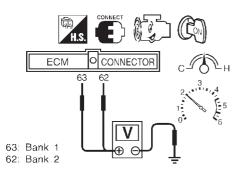
OK •	GO TO 9.
NG ▶	GO TO 8.

Diagnostic Procedure (Cont'd)

### CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

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### **CAUTION:**

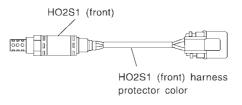
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK ►	GO TO 9.
NG ►	GO TO 8.

### REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

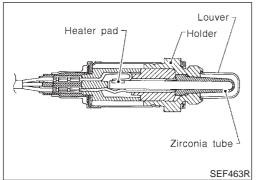
► Replace malfunctioning heated oxygen sensor 1 (front).

Diagnostic Procedure (Cont'd)

9	CHECK HEATED OXYG	GEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT	
1. Tur	n ignition switch "OFF".		
2. Dis	connect joint connector-17	or joint connector-18.	
For	circuit, refer to "DTC P013	30/P0150 HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-165.	
3. Ch	eck the following.		
• Cor	ntinuity between joint conne	ector terminal 1 or 2 and ground	
	nt connector		
`	(Refer to EL-319, "HARNESS LAYOUT".)		
	Continuity should exist.		
	4. Also check harness for short to ground and short to power.		
5. The	5. Then reconnect joint connector-17 or joint connector-18.		
	OK or NG		
OK	<b>•</b>	GO TO 10.	
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.	

10	CHECK INTERMITTENT INCIDENT	
		FOR INTERMITTENT INCIDENT", EC-131. HO2S1 (FRONT) (BANK 1)/(BANK 2) (CIRCUIT)", EC-165.
	<b>&gt;</b>	INSPECTION END

Component Description



# Nixture ratio SEF288D

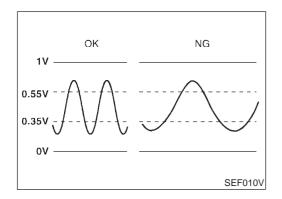
### **Component Description**

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION		
HO2S1 (B1) HO2S1 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V		
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.		



### On Board Diagnosis Logic

To judge the malfunction of heated oxygen sensor 1 (front), this diagnosis measures response time of heated oxygen sensor 1 (front) signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 (front) temperature index. Judgment is based on whether the compensated time [heated oxygen sensor 1 (front) cycling time index] is inordinately long or not.

Malfunction is detected when the response of the voltage signal from the sensor takes more than the specified time.

Possible Cause

### **Possible Cause**

NFEC0681

- Harness or connectors
   (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)
- Fuel pressure
- Injectors
- Intake air leaks
- Exhaust gas leaks
- PCV valve
- Mass air flow sensor

### **DTC Confirmation Procedure**

NFEC0682

### **CAUTION:**

Always drive vehicle at a safe speed.

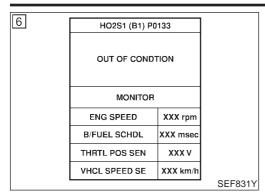
### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

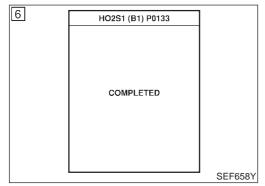
### **TESTING CONDITION:**

- Always perform at a temperature above -10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

DTC Confirmation Procedure (Cont'd)



6	HO2S1 (B1) P0	133	
	110201 (01)10	100	
	TESTING		
	MONITOR		
	ENG SPEED XXX rpm		
	B/FUEL SCHDL	XXX msec	
	THRTL POS SEN	xxx v	
	VHCL SPEED SE	XXX km/h	
		·	SEF832Y



### NITH CONSULT-II

NEECO692S01

- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "HO2S1 (B1) P0133/ HO2S1 (B2) P0153" of "HO2S1 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 3 minutes.

### NOTE:

Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

6) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 40 to 50 seconds.)

ENG SPEED	1,200 - 2,800 rpm (A/T) 1,800 - 3,100 rpm (M/T)
Vehicle speed	80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL	3 - 9 msec (A/T) 2.5 - 9 msec (M/T)
Selector lever	Suitable position

## If "TESTING" is not displayed after 5 minutes, retry from step 2.

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-196.

### **Overall Function Check**

NFEC068

Use this procedure to check the overall function of the heated oxygen sensor 1 (front) circuit. During this check, a 1st trip DTC might not be confirmed.

### WITH GST

NFEC0683S01

- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor monitor (front)]
- 3) Start engine and check the following with engine speed head of a constant 2,000 rpm under no load.
- MI comes on more than five times within 10 seconds.
- 4) If NG, go to "Diagnostic Procedure", EC-196.

Wiring Diagram

### Wiring Diagram NFEC0684 **BANK 1** NFEC0684S01 EC-02S1B1-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC 15A 8 REFER TO EL-POWER. HEATED OXYGEN SENSOR 1 (FRONT)(B1) JOINT CONNECTOR-18 F46 (F2) 63 ECM (F48) F39 F41 REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W M19 -FUSE BLOCK-JUNCTION BOX (J/B) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 77 78 79 80 81 82 83 84 85 86 80 81 82 83 91 92 93 94 95 105 106

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

 ${\tt DO\;NOT\;USE\;ECM\;GROUND\;TERMINALS\;WHEN\;MEASURING\;INPUT/OUTPUT\;VOLTAGE.\;DOING\;SO\;MAY\;RESULT\;IN\;DAMAGE}$ 

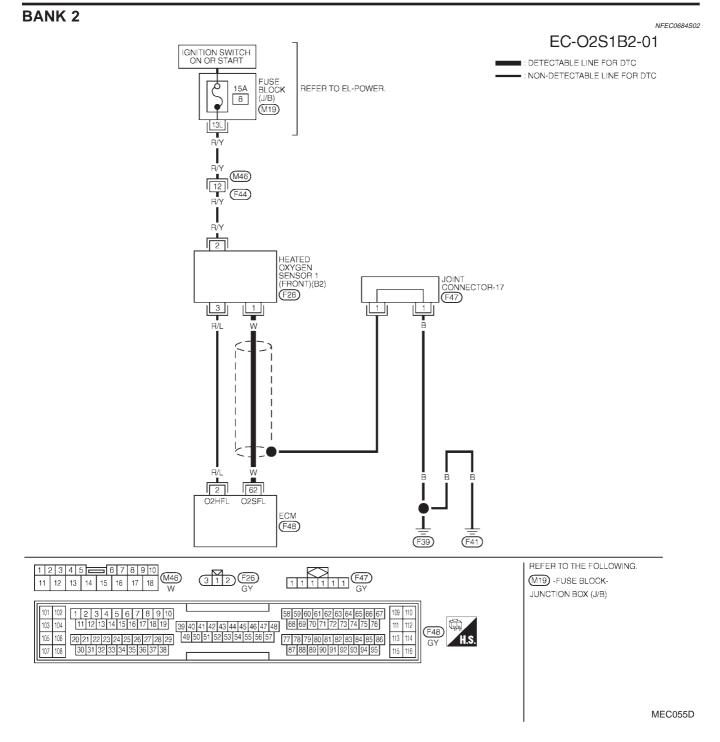
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
63	I V// I	HEATED OXYGEN	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s

SEF854YA

MEC054D

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR, USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND,

TO THE ECN	TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.			
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
62	I W		ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s

SEF855YA

Diagnostic Procedure

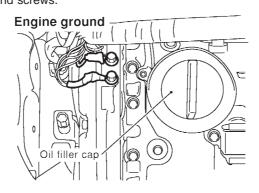
1

### **Diagnostic Procedure**

NFEC0685

**RETIGHTEN GROUND SCREWS** 1. Turn ignition switch "OFF".

2. Loosen and retighten engine ground screws.



SEF255X

GO TO 2.

### 2 **RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)**

Loosen and retighten corresponding heated oxygen sensor 1 (front).

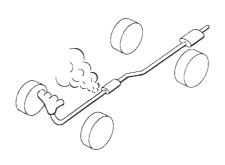
**Tightening torque:** 

40 - 60 N-m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

GO TO 3.

### **CHECK FOR EXHAUST AIR LEAK**

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust air leak before three way catalyst (Manifold).



SEF099P

OK or NG

OK	GO TO 4.
NG	Repair or replace.

### **CHECK FOR INTAKE AIR LEAK**

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK	<b>•</b>	GO TO 5.
	_	

Repair or replace. NG

Diagnostic Procedure (Cont'd)

5	CLEAR THE SELF-LEARNING DATA
1. Sta 2. Se	h CONSULT-II t engine and warm it up to normal operating temperature. ect "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II. ar the self-learning control coefficient by touching "CLEAR".
	SELF-LEARNING CONT B1 100% B2 100%
1 D.	CLEAR SEF69
Is	engine for at least 10 minutes at idle speed. ne 1st trip DTC P0171, P0172, P0174 or P0175 detected? difficult to start engine?
1. Sta 2. Tu 3. Dis 4. Sta 5. Ma 6. Era 7. Ma 8. Ru Is	hout CONSULT-II It engine and warm it up to normal operating temperature. In ignition switch "OFF". It connect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed. It is engine and reconnect mass air flow sensor harness connector. It is sure 1st trip DTC P0100 is displayed. It is trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57. It is sure DTC P0000 is displayed. In engine for at least 10 minutes at idle speed. In e 1st trip DTC P0171, P0172, P0174 or P0175 detected? Indifficult to start engine?
	Yes or No

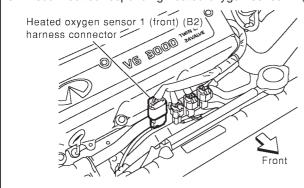
Yes		Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-268, EC-276.
No	•	GO TO 6.

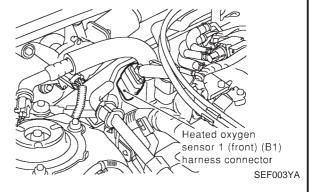
Diagnostic Procedure (Cont'd)

# 6 CHECK HEATED OXYGEN SENSOR 1 (FRONT) HARNESS PROTECTOR COLOR 1. Turn ignition switch "OFF". 2. Check heated oxygen sensor 1 (front) harness protector. HO2S1 (front) HO2S1 (front) harness protector color

HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





■ GO TO 7.

### 7 CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
DIC	ECM	Sensor	Dalik
P0133	63	1	1
P0153	62	1	2

MTBL0486

SEF505YA

### Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank		
DIO	ECM or Sensor	Ground	Dank	
P0133	63 or 1	Ground	1	
P0153	62 or 1	Ground	2	

MTBL0487

### Continuity should not exist.

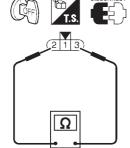
4. Also check harness for short to power.

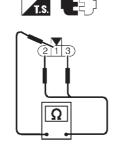
OK ▶	GO TO 8.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

### CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.





Terminals	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2 1 and 3	$\infty\Omega$ (Continuity should not exist.)

SEF310X

### **CAUTION:**

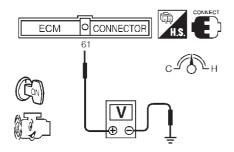
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK ►	GO TO 9.
NG ►	GO TO 13.

### 9 CHECK MASS AIR FLOW SENSOR

- 1. Reconnect harness connectors disconnected.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Check voltage between ECM terminal 61 (Mass air flow sensor signal) and ground.



Condition	Voltage V	
Ignition switch "ON" (Engine stopped.)	Approx. 1.0	
Idle (Engine is warmed-up to normal operating temperature.)	1.2 - 1.8	
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2	
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0	

<sup>\*:</sup> Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

SEF298X

4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Then repeat above check.

### OK or NG

OK •	GO TO 10.
NG ►	Replace mass air flow sensor.

Diagnostic Procedure (Cont'd)

### 10 **CHECK PCV VALVE** 1. Install all removed parts. 2. Start engine and let it idle. 3. Remove PCV valve ventilation hose from PCV valve. 4. Make sure that a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet. SEC137A OK or NG OK (With CONSULT-II) GO TO 11. OK (Without CONSULT-GO TO 12. II) NG Replace PCV valve.

Diagnostic Procedure (Cont'd)

### 11 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
- 3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR				
MONITOR	NO DTC			
ENG SPEED	XXX rpm			
MAS A/F SE-B1	xxx v			
COOLAN TEMP/S	XXX °C			
HO2S1 (B1)	XXX V			
HO2S1 MNTR (B1)	LEAN			

SEF646Y

- 6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below.

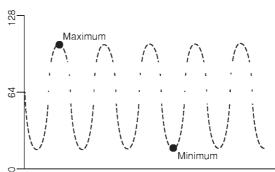
HO2S1 MNTR (B2) R-L-R-L-R-L-R-L-R

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

	,	
Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK	or	NG
----	----	----

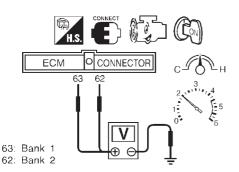
OK •	GO TO 14.
NG ▶	GO TO 13.

Diagnostic Procedure (Cont'd)

### 12 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 gank 2 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

SEF039YA

### **CAUTION:**

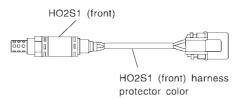
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK ►	GO TO 14.
NG ►	GO TO 13.

### 13 REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

Replace malfunctioning heated oxygen sensor 1 (front).

### 14 CHECK HEATED OXYGEN SENSOR 1 (FRONT) SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect joint connector-17 or joint connector-18.
- 3. Check the following.
- Continuity between joint connector terminal 1 or 2 and ground
- Joint connector

(Refer to EL-319, "HARNESS LAYOUT".)

### Continuity should exist.

- 4. Also check harness for short to ground and short to power.
- 5. Then reconnect joint connector-17 or joint connector-18.

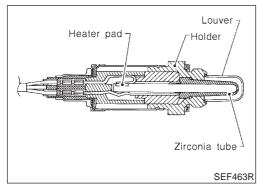
### OK or NG

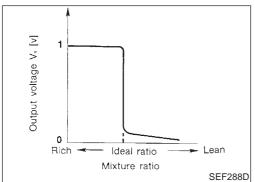
OK •	•	GO TO 15.
NG	•	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

15	15 CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	

Component Description





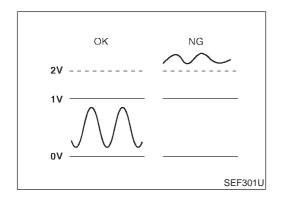
### **Component Description**

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

MONITOR ITEM	CONE	SPECIFICATION	
HO2S1 (B1) HO2S1 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.



### On Board Diagnosis Logic

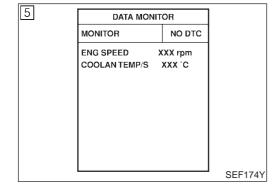
To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 (front) output is not inordinately high. Malfunction is detected when an excessively high voltage from the sensor is sent to ECM.

Possible Cause

### **Possible Cause**

NFEC0689

- Harness or connectors (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)



### **DTC Confirmation Procedure**

NFEC0690

### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

### (P) WITH CONSULT-II

NFEC0690S01

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT-II.
- 5) Restart engine and let it idle for 25 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-208.

### **WITH GST**

NFEC0690S02

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Restart engine and let it idle for 25 seconds.
- 4) Turn ignition switch "OFF" and wait at least 10 seconds.
- 5) Restart engine and let it idle for 25 seconds.
- 6) Select "MODE 3" with GST.
- If DTC is detected, go to "Diagnostic Procedure", EC-208.
- When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.

Wiring Diagram

### **Wiring Diagram** NFEC0691 **BANK 1** NFEC0691S01 EC-02S1B1-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC 15A 8 BLOCK (J/B) REFER TO EL-POWER. (M19) (M46) HEATED OXYGEN SENSOR 1 (FRONT)(B1) JOINT CONNECTOR-18 F46 (F2) 63 ECM (F48) F41 1 2 3 4 5 6 7 8 9 10 1 1 2 3 4 5 16 17 18 W REFER TO THE FOLLOWING. 1 1 1 1 1 1 2 2 2 2 2 2 2 L M19 -FUSE BLOCK-JUNCTION BOX (J/B) 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 109 110 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 (F48) 20 21 22 23 24 25 26 27 28 29 105 106 49 50 51 52 53 54 55 56 57 77 78 79 80 81 82 83 84 85 86 30 31 32 33 34 35 36 37 38 80 81 82 83 91 92 93 94 95

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

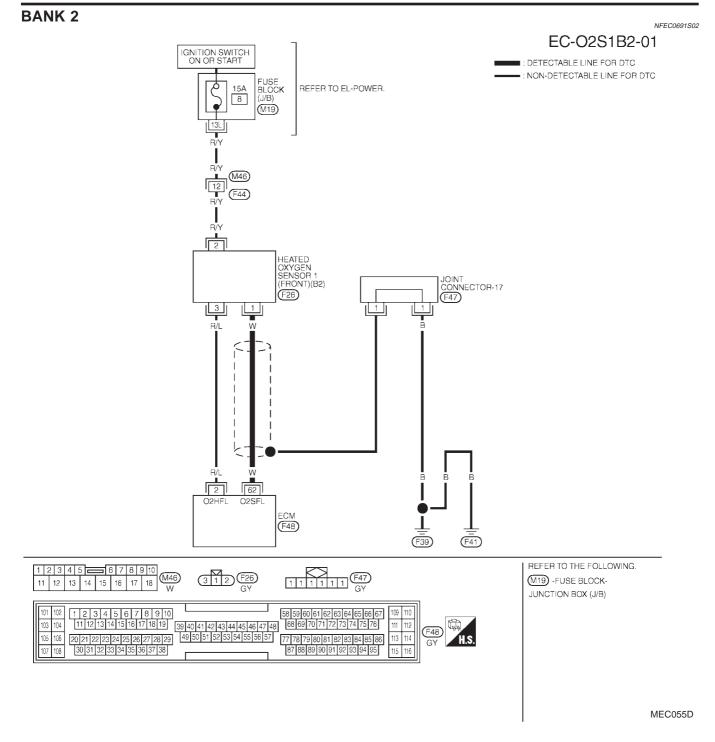
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

	TO THE ECM	E ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.					
-	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)		
	63	I \//	IHEΔIED OXYGEN	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s		

SEF854YA

MEC054D

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR, USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND,

TO THE ECM	O THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)		
62	I W		ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s		

SEF855YA

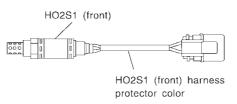
Diagnostic Procedure

### **Diagnostic Procedure**

NFEC0692



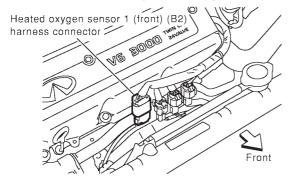
- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.

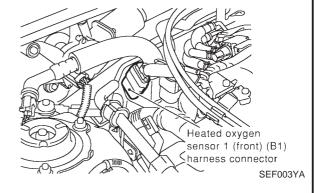


HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





**▶** GO TO 2.

### 2 RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front). **Tightening torque:** 

40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

GO TO 3.

Diagnostic Procedure (Cont'd)

### 3 CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
DIO	ECM	Sensor	Dank
P0134	63	1	1
P0154	62	1	2

MTBL0488

### Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
DIC	ECM or Sensor	Dank	
P0134	63 or 1	Ground	1
P0154	62 or 1	Ground	2

MTBL0489

### Continuity should not exist.

4. Also check harness for short to power.

OK or NG

OK	<b>&gt;</b>	GO TO 4.
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CONNECTOR FOR WATER		
2. Ch	<ol> <li>Disconnect heated oxygen sensor 1 (front) harness connector.</li> <li>Check connectors for water.</li> <li>Water should not exist.</li> </ol>		
	OK or NG		
OK (V	Vith CONSULT-II)	<b></b>	GO TO 5.
OK (V II)	Vithout CONSULT-	<b>&gt;</b>	GO TO 6.
NG		<b>&gt;</b>	Repair or replace harness or connectors.

Diagnostic Procedure (Cont'd)

### 5 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
- 3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR				
MONITOR	NO DTC			
ENG SPEED	XXX rpm			
MAS A/F SE-B1	xxx v			
COOLAN TEMP/S	XXX °C			
HO2S1 (B1)	XXX V			
HO2S1 MNTR (B1)	LEAN			

SEF646Y

- 6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown left:

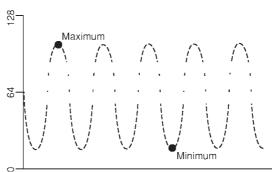
HO2S1 MNTR (B2) R-L-R-L-R-L-R-L-R

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

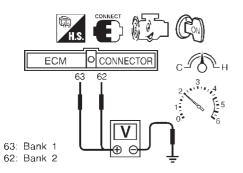
OK •	GO TO 8.
NG ▶	GO TO 7.

Diagnostic Procedure (Cont'd)

### **CHECK HEATED OXYGEN SENSOR 1 (FRONT)**

### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

SEF039YA

### **CAUTION:**

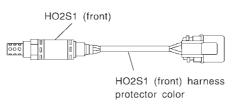
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK •	GO TO 8.
NG ▶	GO TO 7.

### REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

▶ Replace malfunctioning heated oxygen sensor 1 (front).

### 8 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.

► INSPECTION END

### **DTC P0135/P0155 HO2S1 HEATER (FRONT) (BANK 1)/(BANK 2)**

Description

SYSTEM DESCRIPTION

### **Description**

NFEC0693

			NFEC0693S01
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)			Heated oxygen sensors 1
Crankshaft position sensor (REF)			heater (front)

The ECM performs ON/OFF control of the heated oxygen sensor 1 heater (front) corresponding to the engine speed.

### **OPERATION**

NEEC0693502

Engine speed rpm	Heated oxygen sensors 1 heater (front)	
Above 3,600	OFF	
Below 3,600	ON	

### **CONSULT-II Reference Value in Data Monitor** Mode

### Specification data are reference values.

NFEC0694

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	Engine speed: Below 3,600 rpm	ON
HO2S1 HTR (B2)	Engine speed: Above 3,600 rpm	OFF

### On Board Diagnosis Logic

Malfunction is detected when the current amperage in the heated oxygen sensor 1 heater (front) circuit is out of the normal range. [An improper voltage drop signal is sent to ECM through the heated oxygen sensor 1 heater (front).]

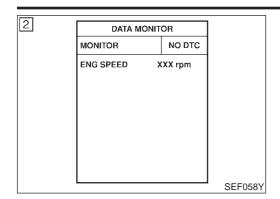
### **Possible Cause**

NFEC0696

- Harness or connectors [The heated oxygen sensor 1 heater (front) circuit is open or shorted.]
- Heated oxygen sensor 1 heater (front)

### **DTC P0135/P0155 HO2S1 HEATER (FRONT) (BANK 1)/(BANK 2)**

DTC Confirmation Procedure



### **DTC Confirmation Procedure**

NFEC0697

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

### WITH CONSULT-II

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and run it for at least 6 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-216.

### **WITH GST**

NFEC0697S02

- 1) Start engine and run it for at least 6 seconds at idle speed.
- Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine and run it for at least 6 seconds at idle speed.
- 4) Select "MODE 3" with GST.
- 5) If DTC is detected, go to "Diagnostic Procedure", EC-216.
- When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.

### **Wiring Diagram** NFFC0698 **BANK 1** NFEC0698S01 EC-02H1B1-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) 15A 8 BEFER TO FL-POWER (M19) (M46) HEATED OXYGEN SENSOR (FRONT) (B1) JOINT CONNECTOR-18 F46 (F2) 2 63 ECM (F48) (F41) REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W (M19) -FUSE BLOCK-JUNCTION BOX (J/B) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 (F48) 20 21 22 23 24 25 26 27 28 29 77 78 79 80 81 82 83 84 85 86 49 50 51 52 53 54 55 56 57 113 114 80 81 82 83 91 92 93 94 95 30 31 32 33 34 35 36 37 38

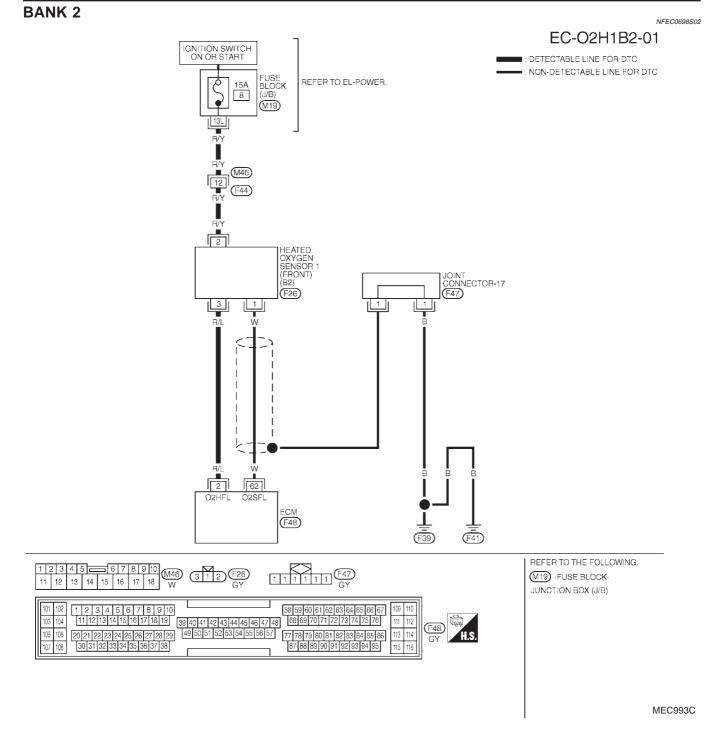
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

[	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
I			HEATED OXYGEN	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
	3	3 OR/L SENSOR 1 HEATER (FRONT) (B1)	ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE	

MEC992C

### DTC P0135/P0155 HO2S1 HEATER (FRONT) (BANK 1)/(BANK 2)

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

				-,	
	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
			HEATED OXYGEN	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
	2	R/L	SENSOR 1 HEATER  (FRONT) (B2)	ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

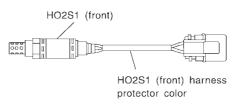
SEF656XC

### **Diagnostic Procedure**

NFEC0699

### 1 CHECK HEATED OXYGEN SENSOR 1 (FRONT) POWER SUPPLY CIRCUIT

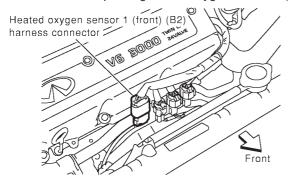
- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.

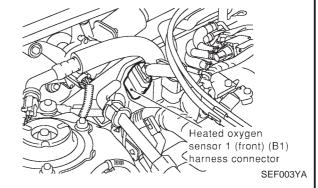


HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

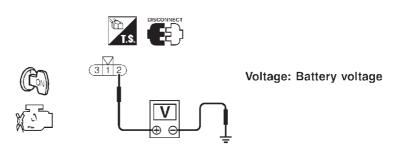
SEF505YA

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.





- 4. Turn ignition switch "ON".
- 5. Check voltage between HO2S1 (front) terminal 2 and ground with CONSULT-II or tester.



SEF311X

OK or NG

OK •	GO TO 3.
NG ►	GO TO 2.

### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse

Repair harness or connectors.

#### DTC P0135/P0155 HO2S1 HEATER (FRONT) (BANK 1)/(BANK 2)

Diagnostic Procedure (Cont'd)

#### 3 CHECK HEATED OXYGEN SENSOR 1 (FRONT) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank	
DIC	ECM	Sensor	Dalik	
P0135	3	3	1	
P0155	2	3	2	

MTBL0490

#### Continuity should exist.

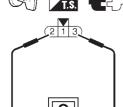
4. Also check harness for short to ground and short to power.

#### OK or NG

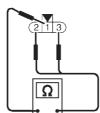
OK •	GO TO 4.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

#### 4 CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.







Terminals	Resistance	
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)	
1 and 2 1 and 3	$\infty\Omega$ (Continuity should not exist.)	

SEF310X

#### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 6.
NG ►	GO TO 5.

#### DTC P0135/P0155 HO2S1 HEATER (FRONT) (BANK 1)/(BANK 2)

Diagnostic Procedure (Cont'd)

# 5 REPLACE HEATED OXYGEN SENSOR 1 (FRONT) 1. Turn ignition switch "OFF". 2. Check heated oxygen sensor 1 (front) harness protector color. HO2S1 (front) HO2S1 (front) harness protector color HO2S1 (front) bank 1): Black HO2S1 (front) (bank 2): Blue CAUTION:

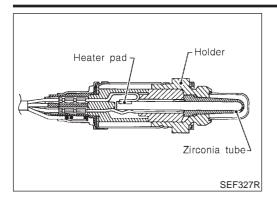
6	CHECK INTERMITTENT INCIDENT			
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	<b>•</b>	INSPECTION END		

Replace malfunctioning heated oxygen sensor 1 (front).

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool

J-43897-18 or J-43897-12 and approved anti-seize lubricant.

Component Description



#### **Component Description**

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

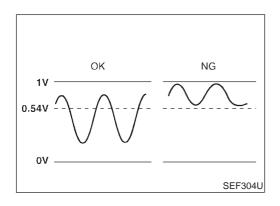
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

# **CONSULT-II** Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0701

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	Engine: After warming up	Revving engine from idle up to 2,000 rpm	$LEAN \longleftrightarrow RICH$



#### On Board Diagnosis Logic

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.

Malfunction is detected when the minimum voltage from the sensor is not reached to the specified voltage.

#### **Possible Cause**

NFEC0703

- Harness or connectors (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors

#### 8 HQ2S2 (B1) P0137 COND1: OUT OF CONDITION COND2: INCOMPLETE COND3: INCOMPLETE MONITOR **ENG SPEED** XXX rpm B/FUEL SCHDL XXX msec COOLAN TEMP/S XXX C VHCL SPEED SE XXX km/h SEF833Y

8	HO2S2 (B1) P0		
	COND1: TESTING		
	COND2: INCOME	PLETE	
	COND3: INCOME	PLETE	
	MONITOR		
	ENG SPEED	XXX rpm	
	B/FUEL SCHDL	XXX msec	
	COOLAN TEMP/S	XXX °C	
	VHCL SPEED SE	XXX km/h	
			SEF834Y

[8]	HO2S2 (B1) P0		
	COND1: COMPL	.ETED	
	COND2: INCOM	PLETE	
	COND3: INCOM	PLETE	
	MONITOR		
	ENG SPEED	XXX rpm	
	B/FUEL SCHDL	XXX msec	
	COOLAN TEMP/S	XXX .C	
	VHCL SPEED SE	XXX km/h	
			SEF835Y

#### **DTC Confirmation Procedure**

NFEC0759

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### IOTF.

- "COMPLETED" will appear on CONSULT-II screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

#### (P) WITH CONSULT-II

NFEC0759S01

Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- Turn ignition switch "ON" and select "HO2S2 (B1) P0137/ HO2S2 (B2) P0157" of "HO2S2 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 30 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load. If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3". If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

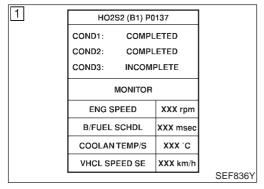
ENG SPEED	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Selector lever	Suitable position

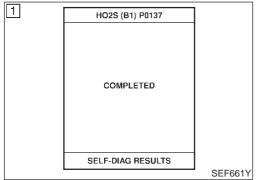
#### NOTE:

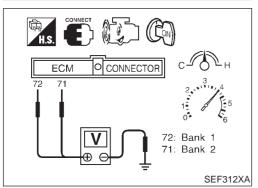
- If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".
- If "COMPLETED" already appears at "COND2" on CON-SULT-II screen before "Procedure for COND2" is

DTC Confirmation Procedure (Cont'd)

conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".







#### Procedure for COND2

While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCÒMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

#### NOTE:

If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".

#### Procedure for COND3

- 1) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
- 2) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-225.

#### **Overall Function Check**

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

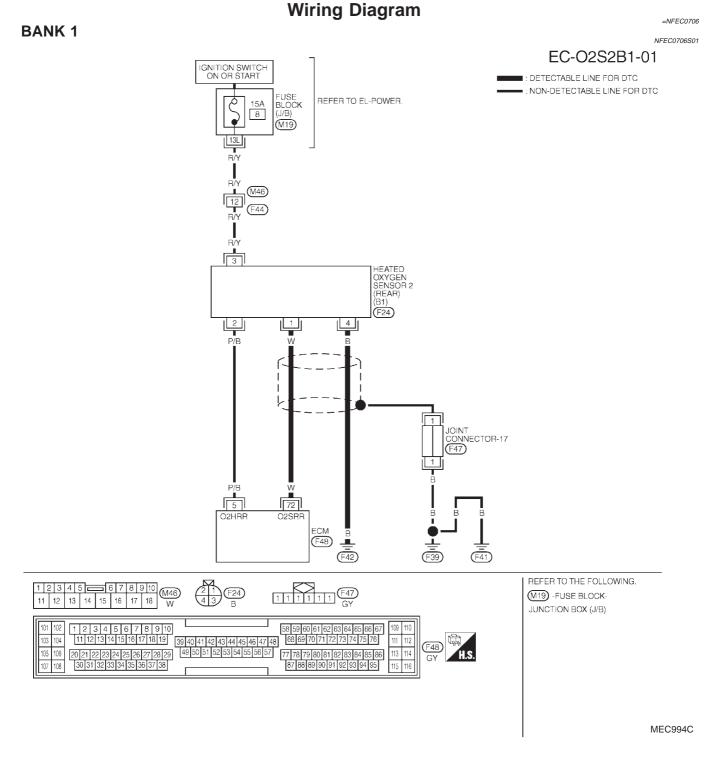
#### WITH GST

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (Depress and release accelerator pedal as soon as possible.) The voltage should be below 0.54V at least once during this procedure.
  - If the voltage can be confirmed in step 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T). The voltage should be below 0.54V at least once during this procedure.

Overall Function Check (Cont'd)

6) If NG, go to "Diagnostic Procedure", EC-225.

Wiring Diagram

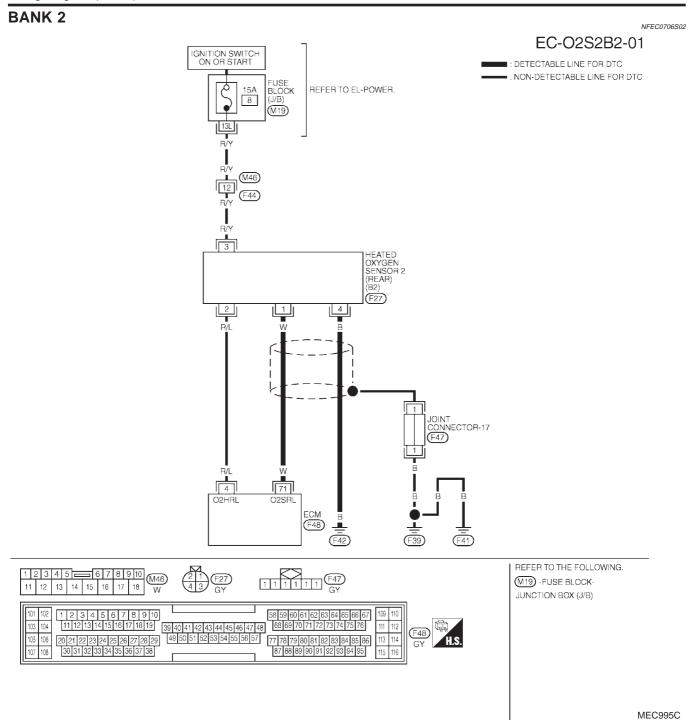


ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72		HEATED OXYGEN SENSOR 2 (REAR) (B1)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

[	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	71	W		ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF658XC

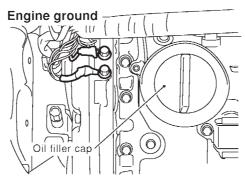
Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0707

#### 1 RETIGHTEN GROUND SCREWS

- 1. Turn ignition switch "OFF".
- 2. Loosen and retighten engine ground screws.



SEF255X

► GO TO 2.

#### 2 CLEAR THE SELF-LEARNING DATA

#### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
- 3. Clear the self-learning control coefficient by touching "CLEAR".

WORK SUPP	ORT	
SELF-LEARNING CONT		B1 100% B2 100%
CLEAR		

SEF652Y

4. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

#### **⋈** Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure 1st trip DTC P0100 is displayed.
- 6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57.
- 7. Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

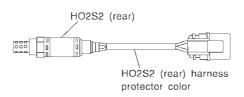
Yes	or	No
-----	----	----

Yes	Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-276.
No	GO TO 3.

Diagnostic Procedure (Cont'd)

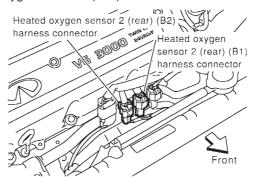
#### 3 CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WA

SEF154Z

- 4. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
DIO	ECM	Sensor	Dank
P0137	72	1	1
P0157	71	1	2

MTBL0491

#### Continuity should exist.

Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank		
DIO	ECM or Sensor	Ground	Dalik	
P0137	72 or 1	Ground	1	
P0157	71 or 1	Ground	2	

MTBL0492

#### Continuity should not exist.

7. Also check harness for short to power.

OK or NG

OK •	GO TO 4.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

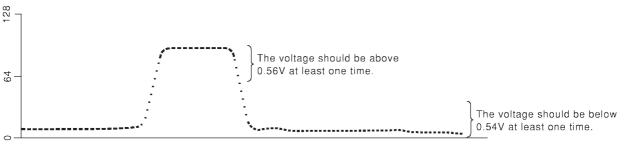
4	CHECK HEATED	OXYG	GEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT
Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.     Refer to Wiring Diagram.     Continuity should exist.      Also check harness for short to ground and short to power.			
	OK or NG		
OK (W	/ith CONSULT-II)	<b></b>	GO TO 5.
OK (W	/ithout CONSULT-	<b>•</b>	GO TO 6.
NG		<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

#### 5 CHECK HEATED OXYGEN SENSOR 2 (REAR)

#### (P) With CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
- 4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

#### CAUTION

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 9.
NG ►	GO TO 8.

<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

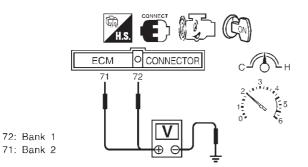
<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

Diagnostic Procedure (Cont'd)

#### 6 CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

#### Without CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4. Check the voltage when rewing up to 4,000 rpm under no load at least 10 times. (Depress and release accelerator pedal as soon as possible.)



The voltage should be above 0.56V at least once during this procedure.

SEF313XB

#### OK or NG

OK ▶	GO TO 9.
NG ▶	GO TO 7.

#### 7 CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

#### **CAUTION:**

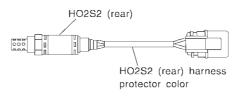
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 9.
NG ▶	GO TO 8.

#### REPLACE HEATED OXYGEN SENSOR 2 (REAR)

- 1. Stop vehicle and turn ignition switch OFF.
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SEF154Z

#### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

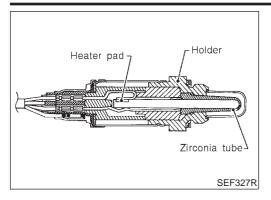
Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

9	CHECK HEATED OXYO	EN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT	
1. Tur	n ignition switch "OFF".		
2. Dis	connect joint connector-17		
3. Ch	eck the following.		
<ul><li>Cor</li></ul>	ntinuity between joint conne	ector terminal 1 and ground	
<ul><li>Joir</li></ul>	Joint connector		
(Re	(Refer to EL-319, "HARNESS LAYOUT".)		
Cor	Continuity should exist.		
4. Als	4. Also check harness for short to ground and short to power.		
5. The	5. Then reconnect joint connector-17.		
OK or NG			
OK	<b>&gt;</b>	GO TO 10.	
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.	

10	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

Component Description



#### **Component Description**

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

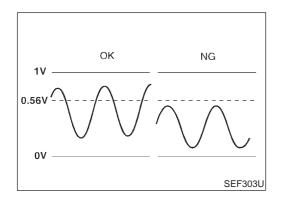
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONE	DITION	SPECIFICATION			
HO2S2 (B1) HO2S2 (B2)		Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V			
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	• Engine, Atter Marming (in		$LEAN \longleftrightarrow RICH$			



#### On Board Diagnosis Logic

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.

Malfunction is detected when the maximum voltage from the sensor is not reached to the specified voltage.

Possible Cause

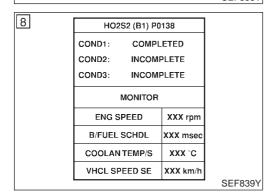
NFEC0711

#### **Possible Cause**

- Harness or connectors
   (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors
- Intake air leaks

#### 8 HQ2S2 (B1) P0138 COND1: OUT OF CONDITION COND2: INCOMPLETE COND3: INCOMPLETE MONITOR **ENG SPEED** XXX rpm B/FUEL SCHDL XXX msec COOLAN TEMP/S XXX C VHCL SPEED SE XXX km/h SEF837Y

8 HO2S2 (B1) P0138 COND1: COND2: INCOMPLETE INCOMPLETE COND3: MONITOR **ENG SPEED** XXX rpm B/FUEL SCHDL XXX msed COOLANTEMP/S XXX °C VHCL SPEED SE XXX km/k SEF838Y



#### **DTC Confirmation Procedure**

NFEC0760

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### IOTF.

- "COMPLETED" will appear on CONSULT-II screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

#### (P) WITH CONSULT-II

NFEC0760S01

Procedure for COND1

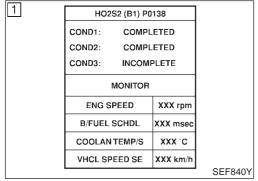
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- Turn ignition switch "ON" and select "HO2S2 (B1) P0138/ HO2S2 (B2) P0158" of "HO2S2 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 30 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load. If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3". If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

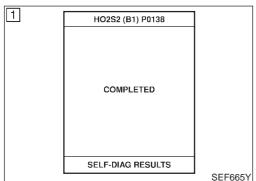
ENG SPEED	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Selector lever	Suitable position

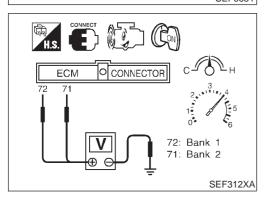
#### NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".
- If "COMPLETED" already appears at "COND2" on CON-SULT-II screen before "Procedure for COND2" is

conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".







#### Procedure for COND2

 While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

#### NOTE:

If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".

#### Procedure for COND3

- 1) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
  - If "NG" is displayed, refer to "Diagnostic Procedure", EC-236.

#### **Overall Function Check**

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

#### **WITH GST**

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (Depress and release accelerator pedal as soon as possible.) The voltage should be above 0.56V at least once during this procedure.
  - If the voltage can be confirmed in step 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T). The voltage should be above 0.56V at least once during this procedure.

Overall Function Check (Cont'd)

6) If NG, go to "Diagnostic Procedure", EC-236.

Wiring Diagram

#### **Wiring Diagram** =NFEC0714 **BANK 1** NFEC0714S01 EC-02S2B1-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC REFER TO EL-POWER 8 (M19) HEATED OXYGEN SENSOR 2 (REAR) (B1) 2 4 JOINT CONNECTOR-17 72 (F48) REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W (M19) -FUSE BLOCK-JUNCTION BOX (J/B) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 (F48) 20 21 22 23 24 25 26 27 28 29 77 78 79 80 81 82 83 84 85 86 49 50 51 52 53 54 55 56 57 30 31 32 33 34 35 36 37 38 87 88 89 90 91 92 93 94 95

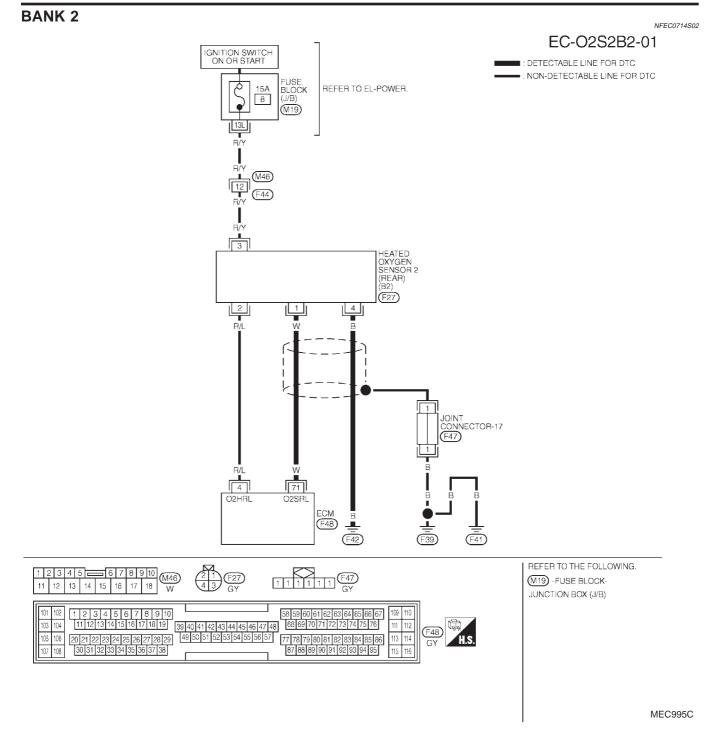
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72			ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

MEC994C

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (B2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF658XC

Diagnostic Procedure

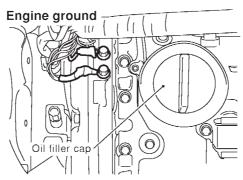
1

### **Diagnostic Procedure**

1. Turn ignition switch "OFF".

2. Loosen and retighten engine ground screws.

**RETIGHTEN GROUND SCREWS** 



SEF255X

NFEC0715

GO TO 2.

#### 2 **CLEAR THE SELF-LEARNING DATA**

#### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
- 3. Clear the self-learning control coefficient by touching "CLEAR".

WORK SUPPO	RT	
SELF-LEARNING CONT		B1 100% B2 100%
CLEAR		

SEF652Y

4. Run engine for at least 10 minutes at idle speed. Is the 1st trip DTC P0171 or P0174 detected?

Is it difficult to start engine?

#### **⋈** Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure 1st trip DTC P0100 is displayed.
- 6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57.
- 7. Make sure DTC P0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

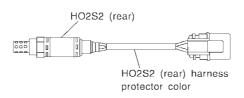
#### Yes or No

Yes	Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-268.
No	GO TO 3.

Diagnostic Procedure (Cont'd)

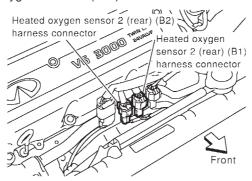
#### 3 CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WA

SEF154Z

- 4. Disconnect ECM harness connector.
- 5. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		- Bank	
DIO	ECM	Sensor	Dank	
P0138	72	1	1	
P0158	71	1	2	

MTBL0493

#### Continuity should exist.

Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	inals	Bank	
DIO	ECM or Sensor	Ground	Dalik	
P0138	72 or 1	Ground	1	
P0158	71 or 1	Ground	2	

MTBL0494

#### Continuity should not exist.

7. Also check harness for short to power.

#### OK or NG

OK •	GO TO 4.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

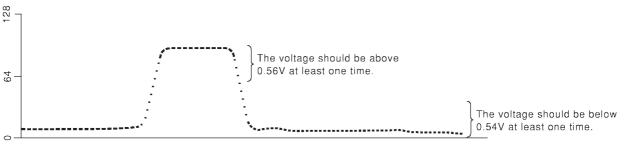
4	CHECK HEATED	OXYC	GEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT
Refe	Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.     Refer to Wiring Diagram.     Continuity should exist.      Also check harness for short to ground and short to power.		
	OK or NG		
OK (W	OK (With CONSULT-II)   GO TO 5.		
OK (W	OK (Without CONSULT- GO TO 6.		
NG		<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

#### 5 CHECK HEATED OXYGEN SENSOR 2 (REAR)

#### (P) With CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
- 4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

#### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 9.
NG ▶	GO TO 8.

<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

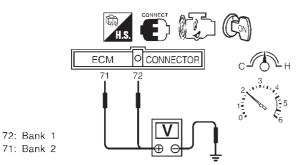
<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

Diagnostic Procedure (Cont'd)

#### 6 CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

#### **Without CONSULT**

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times. (Depress and release accelerator pedal as soon as possible.)



The voltage should be above 0.56V at least once during this procedure.

SEF313XB

#### OK or NG

OK ▶	GO TO 9.
NG ►	GO TO 7.

#### 7 CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

#### **CAUTION:**

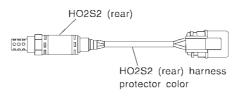
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 9.
NG ▶	GO TO 8.

#### REPLACE HEATED OXYGEN SENSOR 2 (REAR)

- 1. Stop vehicle and turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SEF154Z

#### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

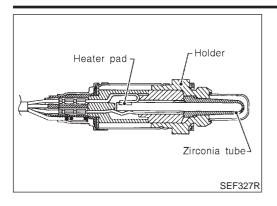
Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

9	CHECK HEATED OXYO	GEN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT		
1. Tu	1. Turn ignition switch "OFF".			
2. Di:	sconnect joint connector-17	,		
3. Ch	neck the following.			
• Co	ntinuity between joint conn	ector terminal 1 and ground		
<ul><li>Joi</li></ul>	nt connector			
(Re	efer to EL-319, "HARNESS	LAYOUT".)		
	Continuity should exist.			
4. Als	4. Also check harness for short to ground and short to power.			
5. Th	5. Then reconnect joint connector-17.			
	OK or NG			
OK	OK ▶ GO TO 10.			
NG	NG Repair open circuit or short to ground or short to power in harness or connectors.			

10	CHECK INTERMITTENT INCIDENT			
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	► INSPECTION END			

Component Description



#### **Component Description**

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

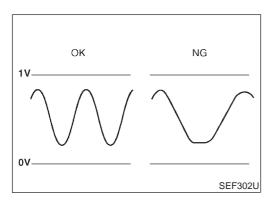
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

# **CONSULT-II** Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0717

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	Engine: After warming up	Revving engine from idle up to 2,000 rpm	$LEAN \longleftrightarrow RICH$



#### On Board Diagnosis Logic

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.

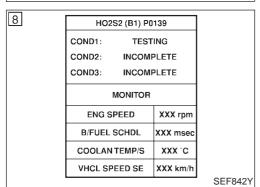
Malfunction is detected when it takes more time for the sensor to respond between rich and lean than the specified time.

#### **Possible Cause**

NFEC0719

- Harness or connectors (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors
- Intake air leaks

#### 8 HQ2S2 (B1) P0139 COND1: OUT OF CONDITION COND2: INCOMPLETE COND3: INCOMPLETE MONITOR **ENG SPEED** XXX rpm B/FUEL SCHDL XXX msec COOLAN TEMP/S XXX C VHCL SPEED SE XXX km/h SEF841Y



[8]	но	2S2 (B1) P0	139	
	COND1:	COMPL	ETED	
	COND2:	INCOM	PLETE	
	COND3:	INCOM	PLETE	
		MONITOR		
	ENG S	SPEED	XXX rpm	
	B/FUEL	SCHDL	XXX msec	
	COOLAN	TEMP/S	XXX °C	
	VHCL SI	PEED SE	XXX km/h	
				SEF843Y

#### **DTC Confirmation Procedure**

NFEC0761

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### IOTF.

- "COMPLETED" will appear on CONSULT-II screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

#### (P) WITH CONSULT-II

NFEC0761S01

Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 conds.
- Turn ignition switch "ON" and select "HO2S2 (B1) P0139/ HO2S2 (B2) P0159" of "HO2S2 (B1)/(B2)" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 30 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load. If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3". If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

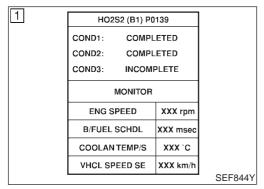
ENG SPEED	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Selector lever	Suitable position

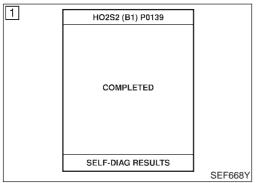
#### NOTE:

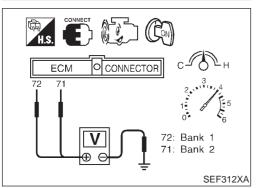
- If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".
- If "COMPLETED" already appears at "COND2" on CON-SULT-II screen before "Procedure for COND2" is

DTC Confirmation Procedure (Cont'd)

conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".







#### Procedure for COND2

 While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

#### NOTE:

If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".

#### Procedure for COND3

- Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
  - If "NG" is displayed, refer to "Diagnostic Procedure", EC-247.

#### **Overall Function Check**

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

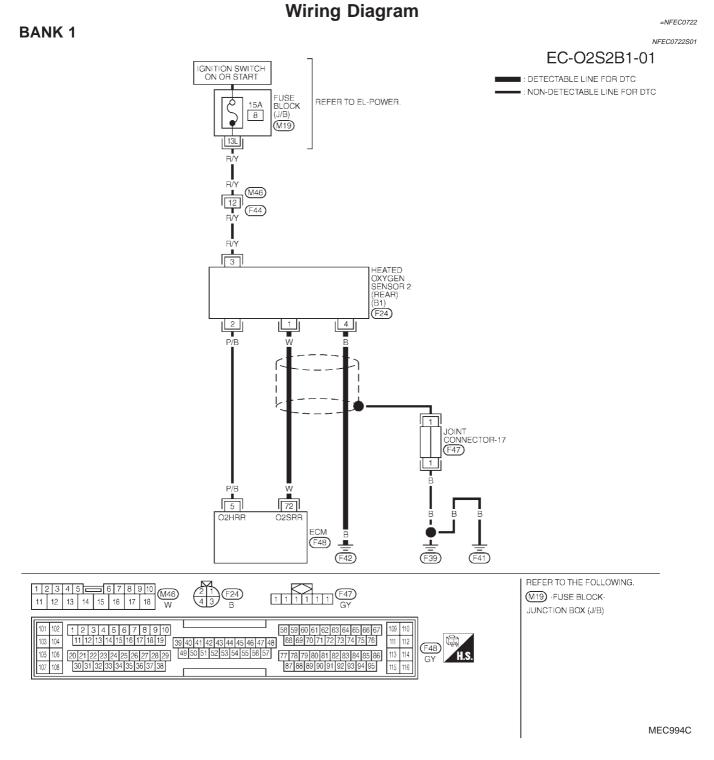
#### **WITH GST**

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (Depress and release accelerator pedal as soon as possible.) The voltage should change at more than 0.06V for 1 second during this procedure.
  - If the voltage can be confirmed in step 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T). The voltage should change at more than 0.06V for 1 second during this procedure.

Overall Function Check (Cont'd)

6) If NG, go to "Diagnostic Procedure", EC-247.

Wiring Diagram

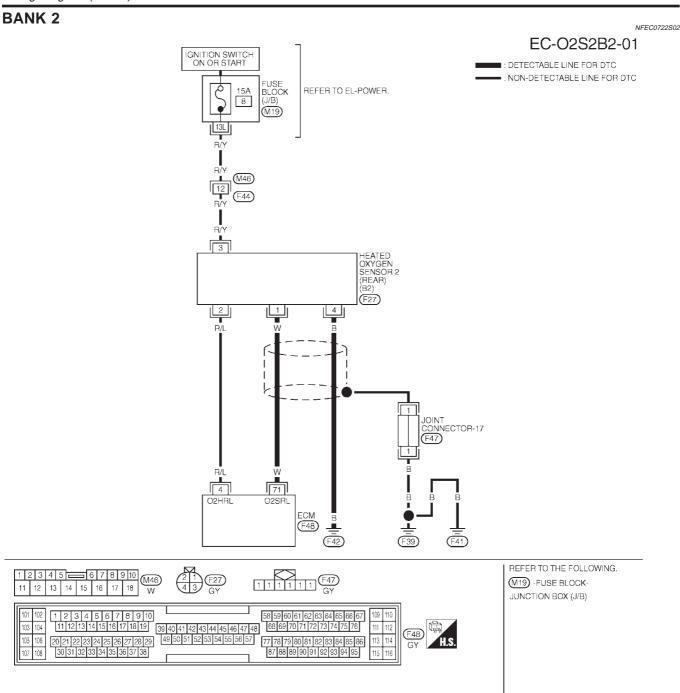


ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72			ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

Wiring Diagram (Cont'd)



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

[	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	71	W		ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF658XC

MEC995C

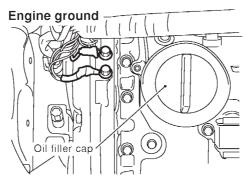
Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0723

#### 1 RETIGHTEN GROUND SCREWS

- 1. Turn ignition switch "OFF".
- 2. Loosen and retighten engine ground screws.



SEF255X

#### 2 CLEAR THE SELF-LEARNING DATA

#### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.

GO TO 2.

3. Clear the self-learning control coefficient by touching "CLEAR".

WORK SUPP	ORT	
SELF-LEARNING CONT		B1 100% B2 100%
CLEAR		

SEF652Y

4. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

#### **⋈** Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure 1st trip DTC No. 0100 is displayed.
- 6. Erase the 1st trip DTC memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57.
- 7. Make sure DTC No. 0000 is displayed.
- 8. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

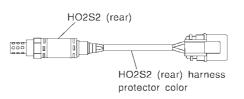
#### Yes or No

•	Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-268, EC-276.
No <b>•</b>	GO TO 3.

Diagnostic Procedure (Cont'd)

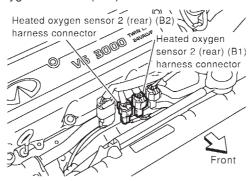
#### 3 CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WA

SEF154Z

- 4. Disconnect ECM harness connector.
- 5. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
DIO	ECM	Sensor	Dank
P0139	72	1	1
P0159	71	1	2

MTBL0495

#### Continuity should exist.

Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank		
DIO	ECM or Sensor	Ground	Dalik	
P0139	72 or 1	Ground	1	
P0159	71 or 1	Ground	2	

MTBL0496

#### Continuity should not exist.

7. Also check harness for short to power.

OK or NG

OK •	GO TO 4.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

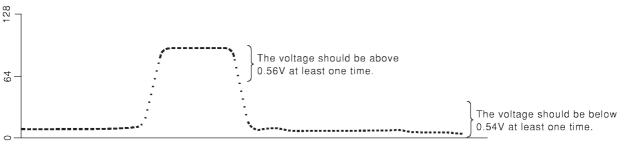
4	CHECK HEATED	OXYC	GEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT	
Check harness continuity between HO2S2 (rear) terminal 4 and engine ground.     Refer to Wiring Diagram.     Continuity should exist.      Also check harness for short to ground and short to power.				
OK or NG				
OK (V	Vith CONSULT-II)	<b></b>	GO TO 5.	
OK (W	Vithout CONSULT-	<b>&gt;</b>	GO TO 6.	
NG		<b>&gt;</b>	Repair open circuit or short to ground or short to power in harness or connectors	

#### 5 CHECK HEATED OXYGEN SENSOR 2 (REAR)

#### (P) With CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
- 4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

#### CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 9.
NG ►	GO TO 8.

<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

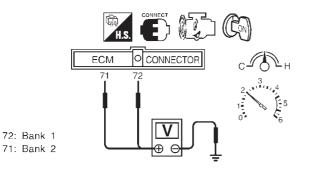
<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

Diagnostic Procedure (Cont'd)

#### 6 CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

#### Without CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times. (Depress and release accelerator pedal as soon as possible.)



The voltage should be above 0.56V at least once during this procedure.

SEF313XB

#### OK or NG

OK ▶	GO TO 9.
NG ►	GO TO 7.

#### 7 CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

#### **CAUTION:**

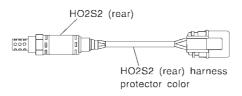
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 9.
NG ▶	GO TO 8.

#### REPLACE HEATED OXYGEN SENSOR 2 (REAR)

- 1. Stop vehicle and turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SEF154Z

#### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

Replace malfunctioning heated oxygen sensor 2 (rear).

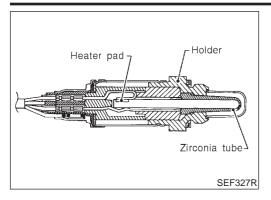
Diagnostic Procedure (Cont'd)

9	CHECK HEATED OXYG	EN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT			
1. Tu	1. Turn ignition switch "OFF".				
2. Dis	sconnect joint connector-17				
3. Ch	3. Check the following.				
• Co	Continuity between joint connector terminal 1 and ground				
<ul><li>Join</li></ul>	Joint connector				
(Re	(Refer to EL-319, "HARNESS LAYOUT".)				
Co	Continuity should exist.				
4. Als	4. Also check harness for short to ground and short to power.				
5. Th	5. Then reconnect joint connector-17.				
OK or NG					
ОК	<b>&gt;</b>	GO TO 10.			
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.			

10	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
► INSPECTION END		INSPECTION END	

#### DTC P0140/P0160 HO2S2 (REAR) (BANK 1)/(BANK 2) (HIGH VOLTAGE)

Component Description



#### **Component Description**

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

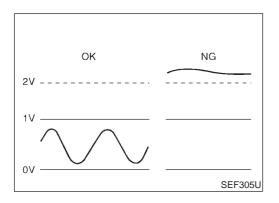
Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

# **CONSULT-II** Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0725

MONITOR ITEM	CONE	SPECIFICATION	
HO2S2 (B1) HO2S2 (B2)		Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	Engine: After warming up		$LEAN \longleftrightarrow RICH$



#### On Board Diagnosis Logic

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst (Manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.

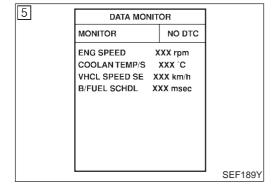
Malfunction is detected when an excessively high voltage from the sensor is sent to ECM.

Possible Cause

## **Possible Cause**

NFEC0727

- Harness or connectors (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)



## **DTC Confirmation Procedure**

NFEC0728

### **CAUTION:**

Always drive vehicle at a safe speed.

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

## (P) WITH CONSULT-II

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 3) Stop vehicle with engine running.
- 4) Let engine idle for 1 minute.
- Maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	1,300 - 3,100 rpm
VHCL SPEED SE	64 - 130 km/h (40 - 80 MPH)
B/FUEL SCHDL	0.5 - 6.4 msec
COOLAN TEMP/S	70 - 100°C (158 - 212°F)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-257.

## ECM CONNECTOR 72: Bank 1 71: Bank 2 SEF312XA

## **Overall Function Check**

Use this procedure to check the overall function of the heated oxvgen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

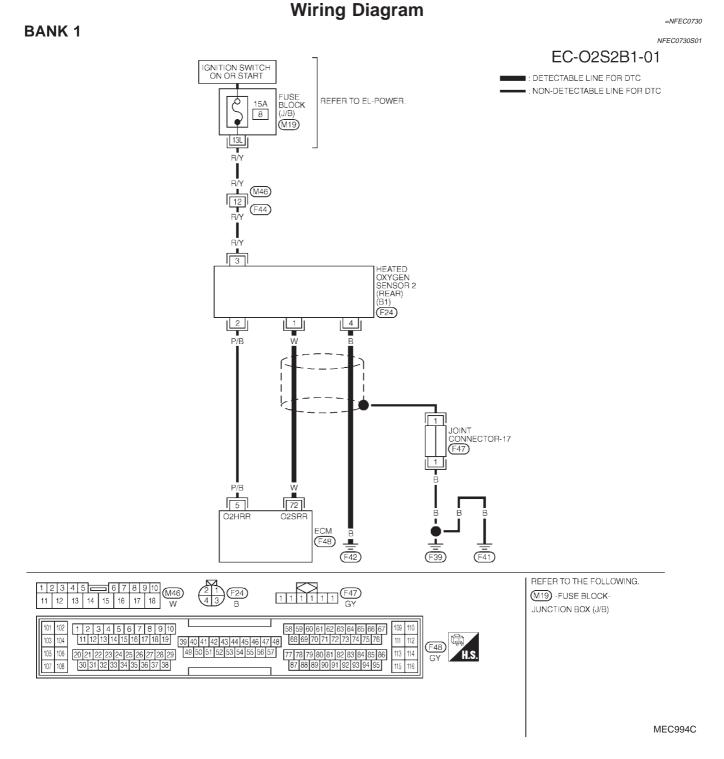
## WITH GST

- Start engine and drive vehicle at a speed of more than 70 km/h 1) (43 MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.

Overall Function Check (Cont'd)

- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (Depress and release accelerator pedal as soon as possible.) The voltage should be below 2V during this procedure.
- 5) If NG, go to "Diagnostic Procedure", EC-257.

Wiring Diagram



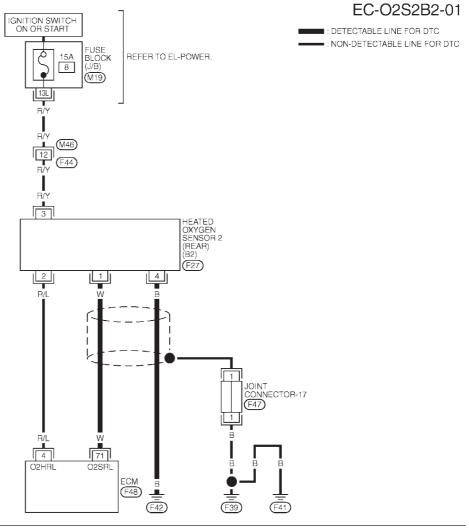
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

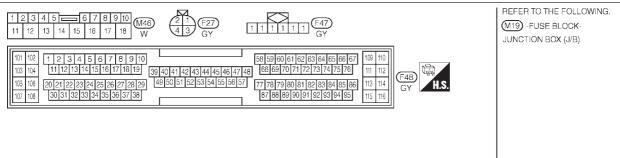
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72			ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

Wiring Diagram (Cont'd)







MEC995C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
71		HEATED OXYGEN SENSOR 2 (REAR) (B2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

SEF658XC

Diagnostic Procedure

## **Diagnostic Procedure**

NFEC0731

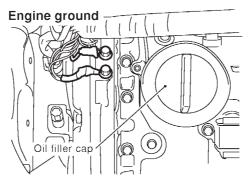
SEF255X

SEF154Z

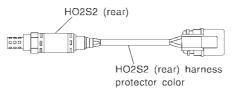
SEF467WA



- 1. Turn ignition switch "OFF".
- 2. Loosen and retighten engine ground screws.

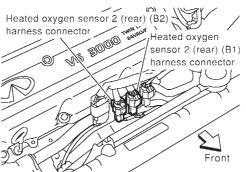


3. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

4. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



5. Disconnect ECM harness connector.

GO TO 2.

Diagnostic Procedure (Cont'd)

## 2 CHECK HEATED OXYGEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Term	ninals	Bank
DIC	ECM	Sensor	Dalik
P0140	72	1	1
P0160	71	1	2

MTBL0497

## Continuity should exist.

2. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	inals	Bank	
DIO	ECM or Sensor	Ground	Dalik	
P0140	72 or 1	Ground	1	
P0160	71 or 1	Ground	2	

MTBL0498

## Continuity should not exist.

3. Also check harness for short to power.

NG

OK or NG

OK ►	GO TO 3.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

## 3 CHECK HEATED OXYGEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT 1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power. OK or NG OK GO TO 4.

Repair open circuit or short to ground or short to power in harness or connectors.

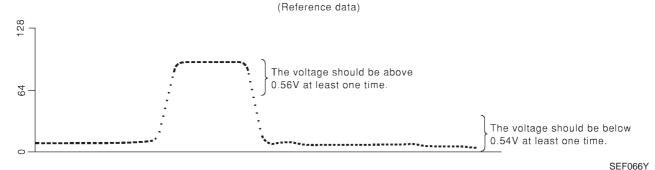
4	CHECK HEATED OXYGEN SENSOR 2 (REAR) CONNECTORS FOR WATER		
	Check heated oxygen sensor 2 (rear) connector and harness connector for water.  Water should not exist.		
	OK or NG		
OK (V	Vith CONSULT-II)	<b>•</b>	GO TO 5.
OK (V II)	Vithout CONSULT-	<b>&gt;</b>	GO TO 6.
NG		<b></b>	Repair or replace harness or connectors.

Diagnostic Procedure (Cont'd)

## 5 CHECK HEATED OXYGEN SENSOR 2 (REAR)

## (P) With CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II
- 4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)/(B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

## **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

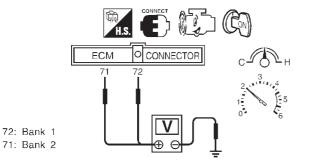
### OK or NG

OK ▶	GO TO 9.
NG ▶	GO TO 8.

## 6 CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

## Without CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times. (Depress and release accelerator pedal as soon as possible.)



The voltage should be above 0.56V at least once during this procedure.

SEF313XB

OK or NG

OK •	GO TO 9.
NG ►	GO TO 7.

Diagnostic Procedure (Cont'd)

## 7 CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

## **CAUTION:**

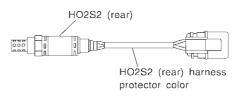
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK •	GO TO 9.
NG ►	GO TO 8.

## 8 REPLACE HEATED OXYGEN SENSOR 2 (REAR)

- 1. Stop vehicle and turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SEF154Z

### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

▶ Replace malfunctioning heated oxygen sensor 2 (rear).

## 9 CHECK HEATED OXYGEN SENSOR 2 (REAR) SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect joint connector-17.
- 3. Check the following.
- Continuity between joint connector terminal 1 and ground
- Joint connector

(Refer to EL-319, "HARNESS LAYOUT".)

Continuity should exist.

- 4. Also check harness for short to ground and short to power.
- 5. Then reconnect joint connector-17.

### OK or NG

OK ▶	GO TO 10.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

10	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	

Description

## **Description**

## SYSTEM DESCRIPTION

NFEC0732

NFECU/32501	
ator	

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)		Heated oxygen sensor	
Crankshaft position sensor (REF)	Tengine speed	2 heater (rear) control	2 heater (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

## **OPERATION**

NFEC0732S02

Engine speed rpm	Heated oxygen sensor 2 heater (rear)
Above 3,600	OFF
Below 3,600	ON

## **CONSULT-II Reference Value in Data Monitor** Mode

## Specification data are reference values.

NFEC0733

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	<ul><li>Ignition switch: ON (Engine stopped)</li><li>Engine is running above 3,600 rpm.</li></ul>	OFF
HO2S2 HTR (B2)	Engine is running below 3,600 rpm after driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	ON

## On Board Diagnosis Logic

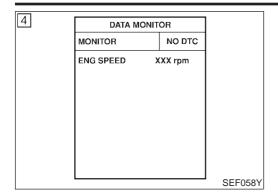
Malfunction is detected when the current amperage in the heated oxygen sensor 2 heater (rear) circuit is out of the normal range. [An improper voltage drop signal is sent to ECM through the heated oxygen sensor 2 heater (rear).]

## **Possible Cause**

NFEC0735

- Harness or connectors [The heated oxygen sensor 2 heater (rear) circuit is open or shorted.]
- Heated oxygen sensor 2 heater (rear)

DTC Confirmation Procedure



## **DTC Confirmation Procedure**

NFEC0736

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

## **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

## WITH CONSULT-II

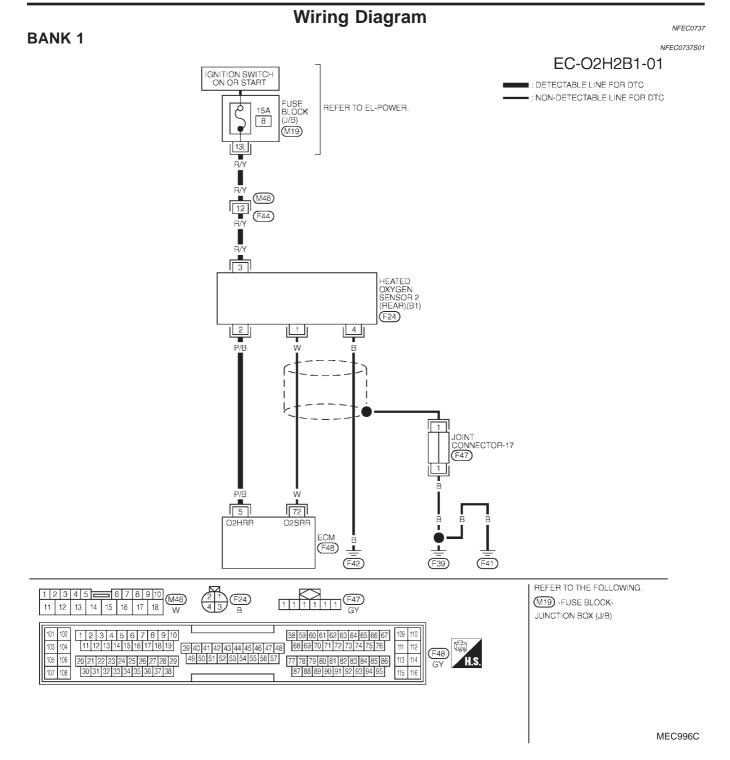
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- Start engine.
- Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle and let engine idle for at least 6 seconds.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-265.

## **WITH GST**

NFEC0736S02

- 1) Start engine.
- 2) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 3) Stop vehicle and let engine idle for at least 6 seconds.
- Turn ignition switch "OFF" and wait at least 10 seconds. 4)
- Start engine. 5)
- 6) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle and let engine idle for at least 6 seconds.
- 8) Select "MODE 3" with GST.
- If DTC is detected, go to "Diagnostic Procedure", EC-265.
- When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.

Wiring Diagram



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)	
			IGN ON	BATTERY VOLTAGE	
		SENSOR 2 HEATER (REAR) (B1)	HEATED OXYGEN	ENGINE RUNNING ABOVE 3,600 RPM	DAITEITI VOLIAGE
5	P/B		ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0 <b>V</b>	

## Wiring Diagram (Cont'd) **BANK 2** NFEC0737S02 EC-O2H2B2-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) REFER TO EL-POWER 8 (M19) (M46) HEATED OXYGEN SENSOR 2 (REAR)(B2) (F27) JOINT CONNECTOR-17 (F47) 4 71 O2HRL ECM (F42) (F39) (F41) REFER TO THE FOLLOWING. 6 7 8 9 10 M46 1 2 3 4 5 = (M19) -FUSE BLOCK-14 15 16 17 18 12 13 JUNCTION BOX (J/B) [1 2 3 4 5 6 7 8 9 10] 11 12 13 14 15 16 17 18 19 19 29 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 20 21 22 23 24 25 26 27 28 29 49 50 51 52 53 54 55 56 57 77 78 79 80 81 82 83 84 85 86 (F48) 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 113 114 77 78 79 80 81 82 83 84 85 86

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

87 88 89 90 91 92 93 94 95

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
			IGN ON	BATTERY VOLTAGE
	HEATED OXYGEN	ENGINE RUNNING ABOVE 3,600 RPM	DALLERT VOLIAGE	
4	R/L		ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V

SEF660XC

MEC997C

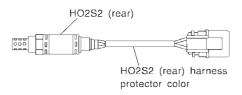
Diagnostic Procedure

## **Diagnostic Procedure**

NFEC0738

## 1 CHECK HEATED OXYGEN SENSOR 2 (REAR) POWER SUPPLY CIRCUIT

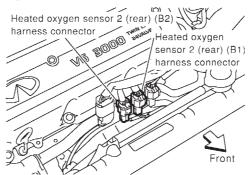
- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

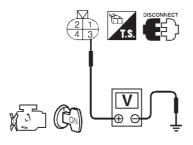
3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.

SEF154Z



SEF467WA

- 4. Turn ignition switch "ON".
- 5. Check voltage between HO2S2 (rear) terminal 3 and ground.



Voltage: Battery voltage

SEF314X

OK	<b>&gt;</b>	GO TO 3.
NG	•	GO TO 2.

## 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- · Harness for open or short between heated oxygen sensor 2 (rear) and fuse
  - Repair harness or connectors.

OK or NG

Diagnostic Procedure (Cont'd)

## 3 CHECK HEATED OXYGEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
DIC	ECM	Sensor	Dalik
P0141	5	2	1
P0161	4	2	2

MTBL0499

## Continuity should exist.

4. Also check harness for short to ground and short to power.

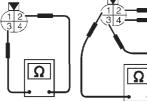
## OK or NG

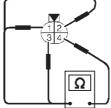
OK •	GO TO 4.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

## 4 CHECK HEATED OXYGEN SENSOR 2 HEATER (REAR)

Check the resistance between HO2S2 (rear) terminals as follows.







Terminal No.	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2, 3, 4	$\infty \Omega$
4 and 1, 2, 3	(Continuity should not exist.)

SEF315X

## **CAUTION:**

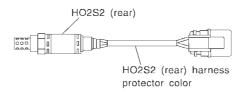
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK •	GO TO 6.
NG ►	GO TO 5.

## REPLACE HEATED OXYGEN SENSOR 2 (REAR)

Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SEF1547

## CAUTION:

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

Replace malfunctioning heated oxygen sensor 2 (rear).

Diagnostic Procedure (Cont'd)

6	6 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

## On Board Diagnosis Logic

NFEC07

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1 (front). The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Injectors

Malfunction is detected when fuel injection system does not operate properly, the amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)

## **Possible Cause**

NFEC0740

- Intake air leaks
- Heated oxygen sensor 1 (front)
- Injectors
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Mass air flow sensor

# WORK SUPPORT SELF-LEARNING CONT B1 100% B2 100% CLEAR SEF652Y

## **DTC Confirmation Procedure**

NFEC0741

## NOTE:

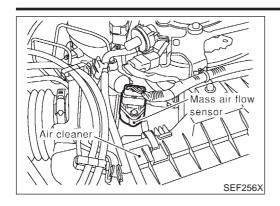
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

### (P) WITH CONSULT-II

NFEC0741S01

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- Turn ignition switch "ON" and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT-II.
- 6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-272.
- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
- 8) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-272. If engine does not start, check exhaust and intake air leak visually.

DTC Confirmation Procedure (Cont'd)



## **WITH GST**

NEEC07/1502

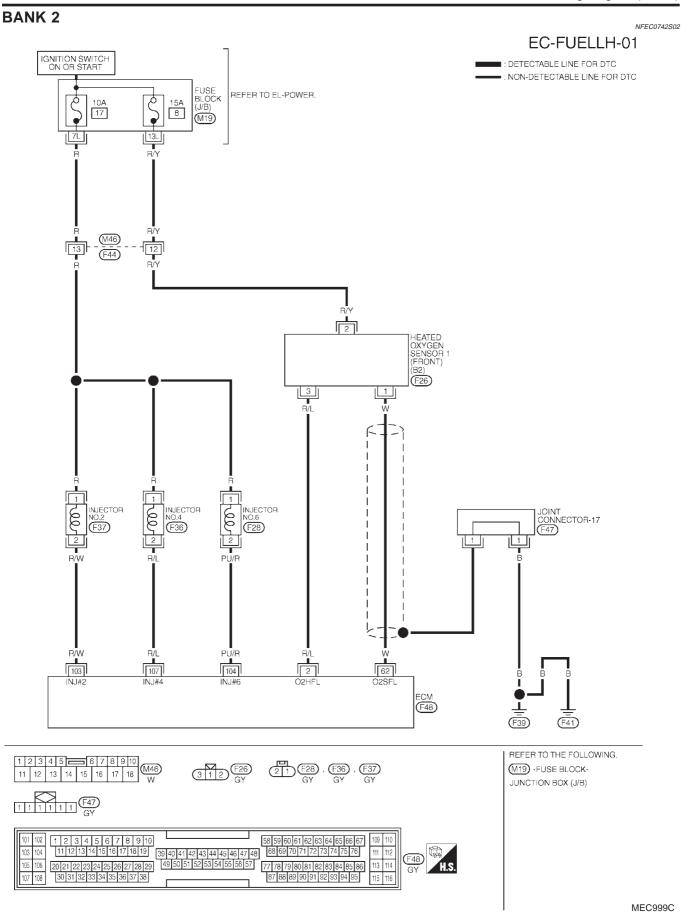
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
- Stop engine and reconnect mass air flow sensor harness connector.
- Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- 6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- 7) Start engine again and let it idle for at least 10 minutes.
- 8) Select "MODE 7" with GST. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-272.
- If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-272. If engine does not start, check exhaust and intake air leak visually.

## Wiring Diagram **Wiring Diagram** NFEC0742 **BANK 1** NFEC0742S01 EC-FUELRH-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) REFER TO EL-POWER 10A 17 15A 8 (M19) (F191) HEATED OXYGEN SENSOR (FRONT) (B1) INJECTOR NO.1 (F192) INJECTOR NO.3 F193 INJECTOR NO.5 JOINT CONNECTOR-18 F46 (F194) L/W OR/L 105 63 ECM F48 Ľ F39 (F41) REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 M19 -FUSE BLOCK-JUNCTION BOX (J/B) 58 59 60 61 62 63 64 65 66 67 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 49 50 51 52 53 54 55 56 57 77 78 79 80 81 82 83 84 85 86

MEC998C

87 88 89 90 91 92 93 94 95

Wiring Diagram (Cont'd)



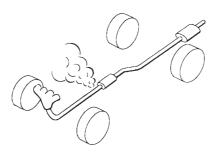
Diagnostic Procedure

## **Diagnostic Procedure**

NFEC0743

## 1 CHECK EXHAUST AIR LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust air leak before three way catalyst (Manifold).



SEF099P

OK or NG

OK I	<b></b>	GO TO 2.
NG		Repair or replace.

2	CHECK FOR INTAKE AIR LEAK		
Listen	Listen for an intake air leak after the mass air flow sensor.		
OK or NG			
ОК	<b>&gt;</b>	GO TO 3.	
NG	<b>&gt;</b>	Repair or replace.	

## 3 CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
	ECM	Sensor	Dank
P0171	63	1	1
P0174	62	1	2

MTBL0500

## Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank		
DIO	ECM or Sensor	Ground	Dank	
P0172	63 or 1	Ground	1	
P0175	62 or 1	Ground	2	

MTBL0501

## Continuity should not exist.

6. Also check harness for short to power.

OK	or	NG
----	----	----

OK •	GO TO 4.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK FUEL PRESSURE		
	1. Release fuel pressure to zero. Refer to EC-36. 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-37.  At idling:  When fuel pressure regulator valve vacuum hose is connected.  235 kPa (2.35 bar, 2.4 kg/cm², 34 psi)  When fuel pressure regulator valve vacuum hose is disconnected.  294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)		
	OK or NG		
ОК	<b>&gt;</b>	GO TO 6.	
NG	<b>&gt;</b>	GO TO 5.	

5	DETECT MALFUNCTIONING PART	
• Fue • Fue	the following.  If pump and circuit (Refer to pressure regulator (Refer to Interest) (Refer to MA-20, "Coll filter for clogging	to EC-37.)
	<b>&gt;</b>	Repair or replace.

## **CHECK MASS AIR FLOW SENSOR** (P) With CONSULT-II 1. Install all removed parts. 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. 2.0 - 6.0 g-m/sec: at idling 7.0 - 20.0 g-m/sec: at 2,500 rpm **With GST** 1. Install all removed parts. 2. Check mass air flow sensor signal in MODE 1 with GST. 2.0 - 6.0 g-m/sec: at idling 7.0 - 20.0 g·m/sec: at 2,500 rpm OK or NG OK GO TO 7. NG Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-139.

Diagnostic Procedure (Cont'd)

## CHECK FUNCTION OF INJECTORS

## (P) With CONSULT-II

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

ACTIVE TEST				
XXX rpm				
xxx v				
XXX step				

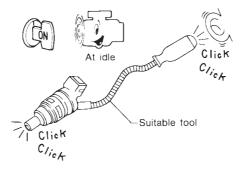
3. Make sure that each circuit produces a momentary engine speed drop.

SEF070Y

MEC703B

## Without CONSULT-II

- 1. Start engine.
- 2. Listen to each injector operating sound.



Clicking noise should be heard.

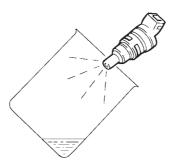
ОК	<b>•</b>	GO TO 8.
NG	<b>•</b>	Perform trouble diagnosis for "INJECTORS", EC-573.

OK or NG

Diagnostic Procedure (Cont'd)

## 8 CHECK INJECTOR

- 1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 2. Turn ignition switch "OFF".
- 3. Disconnect injector harness connectors on bank 2 (for DTC P0171), bank 1 (for DTC P0174).
- 4. Remove injector gallery assembly. Refer to EC-38.
  - Keep fuel hose and all injectors connected to injector gallery.
  - The injector harness connectors on bank 1 (for DTC P0171), bank 2 (for DTC P0174) should remain connected.
- 5. Disconnect all ignition coil harness connectors.
- 6. Prepare pans or saucers under each injector.
- 7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.



Fuel should be sprayed evenly for each injector.

SEF595Q

	1	
OK		GO TO 9.
NG	<b>•</b>	Replace injectors from which fuel does not spray out. Always replace O-ring with new
		ones.

OK or NG

9	CHECK INTERMITTENT INCIDENT	
Refer	efer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	

## On Board Diagnosis Logic

NFEC074

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1 (front). The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Injectors

Malfunction is detected when fuel injection system does not operate properly, the amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)

## **Possible Cause**

NFEC0745

- Heated oxygen sensor 1 (front)
- Injectors
- Exhaust gas leaks
- Incorrect fuel pressure
- Mass air flow sensor

## WORK SUPPORT SELF-LEARNING CONT B1 100% B2 100% CLEAR SEF652Y

## **DTC Confirmation Procedure**

NFEC0746

### NOTE:

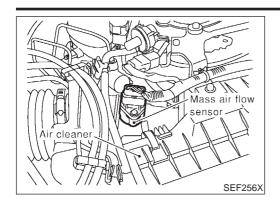
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

### (P) WITH CONSULT-II

NFEC0746S01

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON" and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT-II.
- 6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0172, P0175 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-280.
- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
- Crank engine while depressing accelerator pedal.
   If engine starts, go to "Diagnostic Procedure", EC-280. If engine does not start, remove ignition plugs and check for fouling, etc.

DTC Confirmation Procedure (Cont'd)



## **WITH GST**

NEEC07/6902

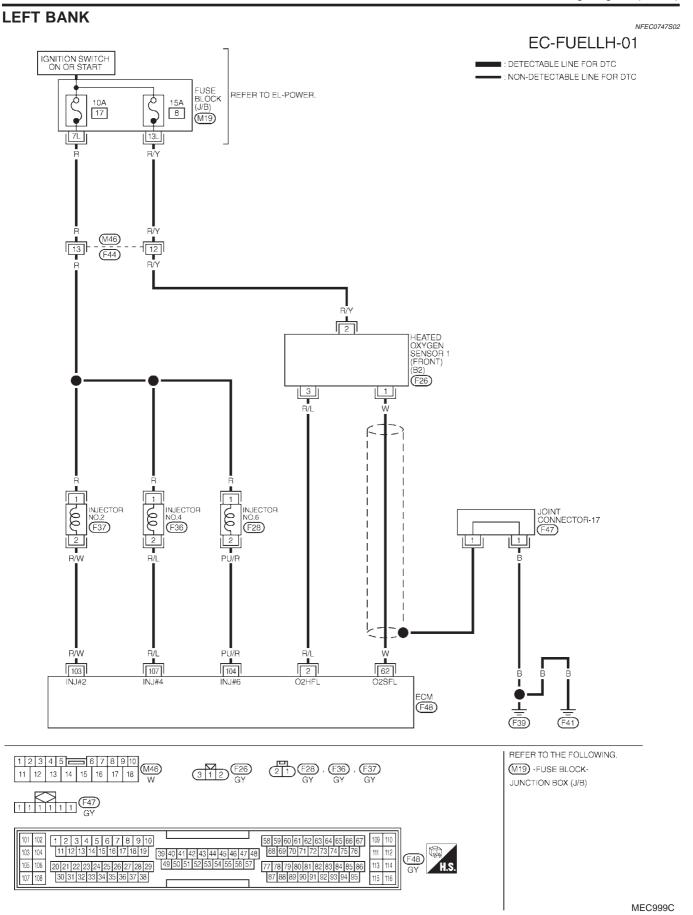
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
- Stop engine and reconnect mass air flow sensor harness connector.
- Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- 6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- 7) Start engine again and let it idle for at least 10 minutes.
- 8) Select "MODE 7" with GST. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-280.
- If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-280. If engine does not start, check exhaust and intake air leak visually.

## Wiring Diagram **Wiring Diagram** NFEC0747 **RIGHT BANK** NFEC0747S01 EC-FUELRH-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) REFER TO EL-POWER 10A 17 15A 8 (M19) (F191) HEATED OXYGEN SENSOR (FRONT) (B1) INJECTOR NO.1 (F192) INJECTOR NO.3 F193 INJECTOR NO.5 JOINT CONNECTOR-18 F46 (F194) L/W OR/L 105 63 ECM F48 Ľ F39 (F41) REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 M19 -FUSE BLOCK-13 14 15 16 17 18 11 12 JUNCTION BOX (J/B) 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 11 12 13 14 15 16 17 18 19 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 49 50 51 52 53 54 55 56 57 77 78 79 80 81 82 83 84 85 86

MEC998C

87 88 89 90 91 92 93 94 95

Wiring Diagram (Cont'd)



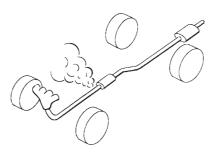
Diagnostic Procedure

## **Diagnostic Procedure**

NFEC0748

## 1 CHECK EXHAUST AIR LEAK

- 1. Start engine and run it at idle.
- 2. Listen for an exhaust air leak before three way catalyst (Manifold).



SEF099P

OK or NG

OK	<b></b>	GO TO 2.
NG	<b></b>	Repair or replace.

2	CHECK FOR INTAKE A	IR LEAK	
Listen for an intake air leak after the mass air flow sensor.			
		OK or NG	
ОК	OK <b>▶</b> GO TO 3.		
NG	<b>&gt;</b>	Repair or replace.	

## 3 CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.
- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

DTC	Term	Bank	
DIC	ECM	Sensor	Dalik
P0172	63	1	1
P0175	62	1	2

MTBL0502

## Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

DTC	Term	Bank		
DIO	ECM or Sensor	Ground	Dank	
P0172	63 or 1	Ground	1	
P0175	62 or 1	Ground	2	

MTBL0503

## Continuity should not exist.

6. Also check harness for short to power.

OK	or	NG
----	----	----

OK		GO TO 4.
NG	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK FUEL PRESSU	RE		
2. Ins	1. Release fuel pressure to zero. Refer to EC-36. 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-37.  At idling:  When fuel pressure regulator valve vacuum hose is connected.  235 kPa (2.34 bar, 2.4 kg/cm², 34 psi)  When fuel pressure regulator valve vacuum hose is disconnected.  294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)			
	OK or NG			
ОК	<b>&gt;</b>	GO TO 6.		
NG	<b>•</b>	GO TO 5.		

5	DETECT MALFUNCTIO	NING PART	
	Check the following.		
	Fuel pump and circuit (Refer to EC-583.)		
• Fue	Fuel pressure regulator (Refer to EC-37.)		
	► Repair or replace.		

6	CHECK MASS AIR FLO	OW SENSOR	
_	Vith CONSULT-II	SW SENSOR	
( )	istall all removed parts.		
		"DATA MONITOR" mode with CONSULT-II.	
2.	0 - 6.0 g·m/sec: at idling		
7.	0 - 20.0 g·m/sec: at 2,500	rpm	
(ST) V	Vith GST		
	stall all removed parts.		
		signal in MODE 1 with GST.	
	0 - 6.0 g·m/sec: at idling		
/.	0 - 20.0 g·m/sec: at 2,500	rpm	
	OK or NG		
OK	<b>•</b>	GO TO 7.	
NG	<b>&gt;</b>	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-139.	

Diagnostic Procedure (Cont'd)

## CHECK FUNCTION OF INJECTORS

## (P) With CONSULT-II

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

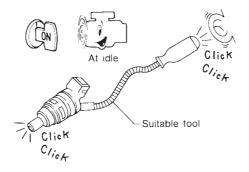
ACTIVE TEST	Г
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS AIF SE-B1	xxx v
IACV-AAC/V	XXX step

3. Make sure that each circuit produces a momentary engine speed drop.

SEF070Y

## Without CONSULT-II

- 1. Start engine.
- 2. Listen to each injector operating sound.



MEC703B

## Clicking noise should be heard.

## OK or NG

OK •	GO TO 8.	
NG •	Perform trouble diagnosis for "INJECTORS", EC-573.	

## 8 CHECK INJECTOR

- 1. Remove injector assembly. Refer to EC-38.
  - Keep fuel hose and all injectors connected to injector gallery.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- 3. Disconnect injector harness connectors bank 2 (for DTC P0172), bank 1 (for P0175). The injector harness connectors on bank 1 (for P0172), bank 2 (for P0175) should remain connected.
- 4. Disconnect all ignition coil harness connectors.
- 5. Prepare pans or saucers under each injectors.
- 6. Crank engine for about 3 seconds.

Make sure fuel does not drip from injector.

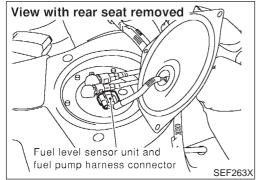
### OK or NG

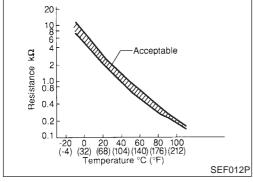
OK (Does not drip.)	<b>•</b>	GO TO 9.
NG (Drips.)	<b>•</b>	Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

9	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END	

## DTC P0180 FUEL TANK TEMPERATURE SENSOR

Component Description





## **Component Description**

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

### <Reference data>

Fuel temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 92 (Fuel tank temperature sensor) and ground.

## **CAUTION:**

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

## On Board Diagnosis Logic

Malfunction is detected when an excessively high or low voltage is sent to ECM, rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.

## **Possible Cause**

NFEC0751

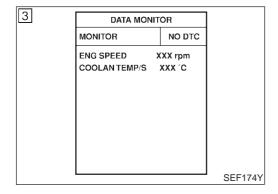
- Harness or connectors (The sensor circuit is open or shorted.)
- Fuel tank temperature sensor

## **DTC Confirmation Procedure**

NOTE:

NFEC0752

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.



## (P) WITH CONSULT-II

NFEC0752S01

- Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- Wait at least 10 seconds.
   If the result is NG, go to "Diagnostic Procedure", EC-286.
   If the result is OK, go to following step.
- 4) Check "COOLAN TEMP/S" value. If "COOLAN TEMP/S" is less than 60°C (140°F), the result will be OK. If "COOLAN TEMP/S" is above 60°C (140°F), go to the following step.
- 5) Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
- Wait at least 10 seconds.
- 7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-286.

## **WITH GST**

NFEC0752S02

Follow the procedure "With CONSULT-II" above.

## **Wiring Diagram** NFEC0753 EC-FTTS-01 FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL TANK TEMPERATURE SENSOR) : DETECTABLE LINE FOR DTC - : NON-DETECTABLE LINE FOR DTC (B19) 5 B : LHD MODELS RHD MODELS 1 : **L** 5: R B3 : (L) B2 : (R) <sup>I</sup>(M6): ⟨L⟩ M2 : (R) ECM F48 (B12) (B7) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W (F48) 77 78 79 80 81 82 83 84 85 86 113 114 87 88 89 90 91 92 93 94 95 115 116

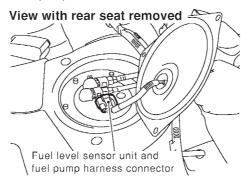
105 106 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

## **Diagnostic Procedure**

NFEC0754

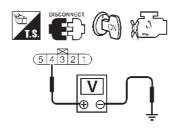
## 1 CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF263X

- 3. Turn ignition switch "ON".
- 4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF586X

OK or NG

OK ►	GO TO 3.
NG ►	GO TO 2.

## 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M6 or B2, M2
- Harness connectors M81, F49
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

Repair harness or connector.

## 3 CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

### Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK •	GO TO 4.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

## DTC P0180 FUEL TANK TEMPERATURE SENSOR

Diagnostic Procedure (Cont'd)

## 

5	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END	

GO TO 5.

Replace fuel level sensor unit.

OK

NG

## DTC P0300 - P0306 NO. 6 - 1 CYLINDER MISFIRE, MULTIPLE CYLINDER MISFIRE

On Board Diagnosis Logic

## On Board Diagnosis Logic

NFEC075

When a misfire occurs, engine speed will fluctuate (vary). If the engine speed fluctuates enough to cause the CKP sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

- 1. One Trip Detection Logic (Three Way Catalyst Damage)
  - On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI will blink.
  - When a misfire condition occurs, the ECM monitors the CKP sensor (POS) signal every 200 engine revolutions for a change.
  - When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off.
  - If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
  - When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
  - If another misfire condition occurs that can damage the TWC, the MI will begin to blink again.
- 2. Two Trip Detection Logic (Exhaust quality deterioration)
  - For misfire conditions that will not cause damage to the TWC (but will affect vehicle emissions), the MI will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor (POS) signal every 1,000 engine revolutions.
  - A misfire malfunction can be detected on any one cylinder or on-multiple cylinders.

Malfunction is detected when multiple cylinders misfire, No. 1 cylinder misfires, No. 2 cylinder misfires, No. 3 cylinder misfires, No. 4 cylinder misfires, No. 5 cylinder misfires and No. 6 cylinder misfires.

## **Possible Cause**

NFEC0756

- Improper spark plug
- Insufficient compression
- Incorrect fuel pressure
- EGR volume control valve
- The injector circuit is open or shorted
- Injectors
- Intake air leak
- The ignition secondary circuit is open or shorted
- Lack of fuel
- Drive plate or flywheel
- Heated oxygen sensor 1 (front)

DTC Confirmation Procedure

DATA MONITOR

MONITOR

NO DTC

ENG SPEED XXX rpm

COOLAN TEMP/S XXX 'C

VHCL SPEED SE XXX km/h

P/N POSI SW OFF

B/FUEL SCHDL XXX msec

SEF213Y

#### **DTC Confirmation Procedure**

**CAUTION:** 

Always drive vehicle at a safe speed.

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### (P) WITH CONSULT-II

NEEC0757S01

NFEC0757

- 1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT-II.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.

Hold the accelerator pedal as steady as possible.

#### NOTE:

Refer to the freeze frame data for the test driving conditions.

5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-289.

#### **WITH GST**

Follow the procedure "With CONSULT-II" above.

NFEC0757S02

#### **Diagnostic Procedure**

NFEC0758

1	CHECK FOR INTAKE AIR LEAK		
	Start engine and run it at idle speed.     Listen for the sound of the intake air leak.		
	OK or NG		
OK	<b>•</b>	GO TO 2.	
NG	<b>•</b>	Discover air leak location and repair.	

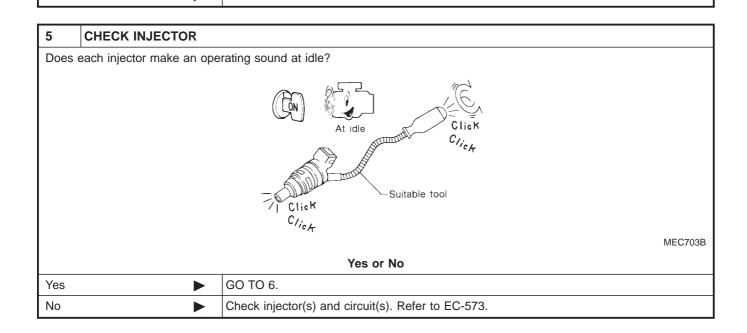
2	2 CHECK FOR EXHAUST SYSTEM CLOGGING		
1. Sto	Stop engine and visually check exhaust tube, three way catalyst (Manifold) and muffler for dents.		
	OK or NG		
OK	<b>•</b>	GO TO 3.	
NG	<b>•</b>	Repair or replace it.	

3	CHECK EGR FUNCTION		
Perfor	Perform "DTC Confirmation Procedure" of "DTC P1402 EGR FUNCTION (OPEN)". Refer to EC-425.		
	OK or NG		
OK	<b>&gt;</b>	GO TO 4.	
NG	<b>&gt;</b>	Repair EGR system.	

Diagnostic Procedure (Cont'd)

No

#### PERFORM POWER BALANCE TEST (P) With CONSULT-II 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode. ACTIVE TEST POWER BALANCE MONITOR **ENG SPEED** XXX rpm MAS A/F SE-B1 XXX V IACV-AAC/V XXX step SEF190Y 2. Is there any cylinder which does not produce a momentary engine speed drop? Without CONSULT-II When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop? ntake manifold collector Injector harness connector (Bank 2) SEF281XA Yes or No GO TO 5. Yes



**GO TO 8.** 

Diagnostic Procedure (Cont'd)

# 6 CHECK IGNITION SPARK 1. Disconnect ignition wire from spark plug. 2. Connect a known good spark plug to the ignition wire. 3. Place end of spark plug against a suitable ground and crank engine. 4. Check for spark. SEF575Q OK or NG OK GO TO 7. NG Check ignition coil, power transistor and their circuits. Refer to "IGNITION SIGNAL", EC-545.

7	CHECK SPARK PLUG	S	
Rem	Remove the spark plugs and check for fouling, etc.		
		SEF156I	
		OK or NG	
OK	<b>•</b>	GO TO 8.	
NG	<b>&gt;</b>	Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-15, "ENGINE MAINTENANCE".	

8	CHECK COMPRESSION PRESSURE		
Check	Check compression pressure. Refer to EM-11, "Measurement of Compression Pressure".		
Sta	andard:		
	1,275 kPa (12.75 bar,	, 13.0 kg/cm <sup>2</sup> , 185 psi)/300 rpm	
Minimum:			
	981 kPa (9.81 bar, 10	0.0 kg/cm <sup>2</sup> , 142 psi)/300 rpm	
	ference between eac		
98 kPa (0.98 bar, 1.0 kg/cm <sup>2</sup> , 14 psi)/300 rpm			
		OK or NG	
OK	)	<b>▶</b> GO TO 9.	
NG		Check pistons, piston rings, valves, valve seats and cylinder head gaskets.	

Diagnostic Procedure (Cont'd)

9	CHECK FUEL PRESSU	RE	
2. Rel 3. Ins	1. Install all removed parts. 2. Release fuel pressure to zero. Refer to EC-36. 3. Install fuel pressure gauge and check fuel pressure. Refer to EC-37.  At idle:  Approx. 235 kPa (2.35 bar, 2.4 kg/cm², 34 psi)		
	OK or NG		
OK	<b>&gt;</b>	GO TO 11.	
NG	<b>&gt;</b>	GO TO 10.	

# 10 DETECT MALFUNCTIONING PART Check the following. • Fuel pump and circuit (Refer to EC-583.) • Fuel pressure regulator (Refer to EC-37.) • Fuel lines (Refer to MA-20, "Checking Fuel Lines".) • Fuel filter for clogging Repair or replace.

11	CHECK IGNITION TIM	ING		
Chec	Check the following items. Refer to "Basic Inspection", EC-92.			
		Items	Specifications	
		Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)	
		Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF	
		Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)	
				MTBL0623
			OK or NG	
OK (	With CONSULT-II)	GO TO 12.		
OK ( II)	Without CONSULT-	GO TO 13.		
NG	<b>•</b>	Follow the "Basic Insp	pection".	

Diagnostic Procedure (Cont'd)

#### 12 CHECK HEATED OXYGEN SENSOR 1 (FRONT) (B1)/(B2)

#### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" in "DATA MONITOR" mode with CONSULT-II, and select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 3. Hold engine speed at 2,000 rpm under no load during the following steps.
- 4. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	xxx v
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	xxx v
HO2S1 MNTR (B1)	LEAN

SEF646Y

- 5. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown left:

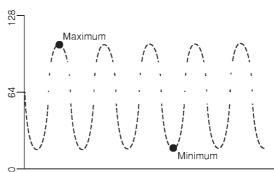
HO2S1 MNTR (B2) R-L-R-L-R-L-R-L-R

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

		1
Trigger	ENG	HO2S1
	SPEED	(B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

#### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK	or	NG
----	----	----

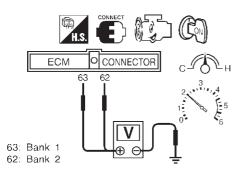
OK •	GO TO 15.
NG ▶	GO TO 14.

Diagnostic Procedure (Cont'd)

#### 13 CHECK HEATED OXYGEN SENSOR 1 (FRONT) (B1)/(B2)

#### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 2 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

SEF039YA

#### **CAUTION:**

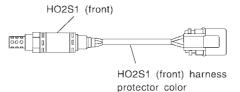
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK ►	GO TO 15.
NG ►	GO TO 14.

#### 14 REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

► Replace malfunctioning heated oxygen sensor 1 (front).

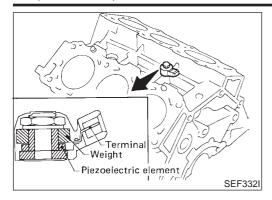
Diagnostic Procedure (Cont'd)

15	CHECK MASS AIR FLOW SENSOR				
Checl 2.0	With CONSULT-II Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-II.  2.0 - 6.0 g·m/sec: at idling 7.0 - 20.0 g·m/sec: at 2,500 rpm				
Checl 2.0	With GST Check mass air flow sensor signal in MODE 1 with GST. 2.0 - 6.0 g·m/sec: at idling 7.0 - 20.0 g·m/sec: at 2,500 rpm				
	OK or NG				
OK	OK ▶ GO TO 16.				
NG	NG Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-139.				

16	6 CHECK SYMPTOM MATRIX CHART				
Check	Check items on the rough idle symptom in "Symptom Matrix Chart", EC-110.				
	OK or NG				
OK	OK ▶ GO TO 17.				
NG	NG Repair or replace.				

17	ERASE THE 1ST TRIP DTC			
	Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-57.  Some tests may cause a 1st trip DTC to be set.			
	▶ GO TO 18.			

18	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		



#### **Component Description**

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM. Freeze frame data will not be stored in the ECM for the knock sensor. The MI will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

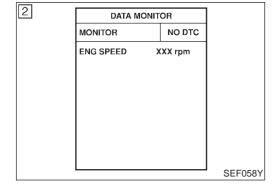
#### On Board Diagnosis Logic

Malfunction is detected when an excessively low or high voltage from the knock sensor is sent to ECM.

#### Possible Cause

NFEC049

- Harness or connectors (The knock sensor circuit is open or shorted.)
- Knock sensor



#### **DTC Confirmation Procedure**

NFEC0188

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

#### (P) WITH CONSULT-II

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II
- Start engine and run it for at least 5 seconds at idle speed.
- 3) If DTC is detected, go to "Diagnostic Procedure", EC-299.

#### **® WITH GST**

NFEC0188S04

Follow the procedure "WITH CONSULT-II" above.

#### NO TOOLS

- Start engine and run it for at least 5 seconds at idle speed. 1)
- Turn ignition switch "OFF", wait at least 10 seconds and then turn "ŎN".

#### DTC P0325 KNOCK SENSOR (KS)

DTC Confirmation Procedure (Cont'd)

- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-299.

# **Wiring Diagram** =NFEC0189 EC-KS-01 : DETECTABLE LINE FOR DTC ECM F48 : NON-DETECTABLE LINE FOR DTC KNK 93 JOINT CONNECTOR-18 F39) (F41) 1 1 1 1 1 1 2 2 2 2 2 2 E46 L 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 77 72 73 74 75 76 (F48) 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 49 50 51 52 53 54 55 56 57 105 106 113 114

MEC736C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
93	W	KNOCK SENSOR	ENGINE RUNNING AT IDLE SPEED	APPROX. 2.5V

SEF663XB

#### **Diagnostic Procedure**

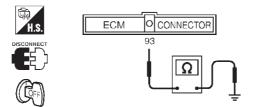
NFEC0190

#### 1 CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check resistance between ECM terminal 93 and engine ground.

#### NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .



Resistance: Approximately 500 - 620  $k\Omega$  [at 25°C (77°F)]

SEF321X

4. Also check harness for short to ground and short to power.

#### OK or NG

OK •	GO TO 5.
NG ►	GO TO 2.

#### 2 CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

- 1. Disconnect knock sensor harness connector.
- 2. Check harness continuity between ECM terminal 93 and knock sensor terminal 1. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

#### OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 3.

#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connector F8, F131
- Harness for open or short between ECM and knock sensor
  - Repair open circuit or short to ground or short to power in harness or connectors.

#### DTC P0325 KNOCK SENSOR (KS)

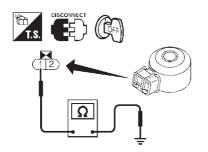
Diagnostic Procedure (Cont'd)

#### 4 CHECK KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

#### NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M $\Omega$ .



Resistance: 500 - 620 kΩ [at 25°C (77°F)]

SEF322X

#### CAUTION

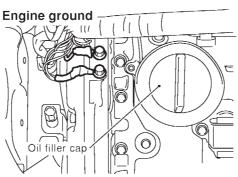
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

OK or NG

OK •	GO TO 8.
NG ▶	Replace knock sensor.

#### 5 RETIGHTEN GROUND SCREWS

Loose and retighten engine ground screws.



SEF255X

▶ GO TO 6.

#### 6 CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect harness connectors F8, F131.
- 2. Check harness continuity between harness connector F8 terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

OK or NG

OK		GO TO 8.
NG	<b>•</b>	GO TO 7.

#### 7 DETECT MALFUNCTIONING PART

Check the following.

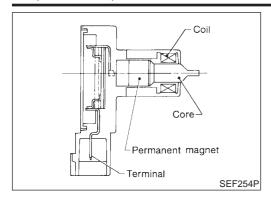
- Harness connectors F8, F131
- Joint connectors-18
- Harness for open or short between harness connector F8 and engine ground
  - Repair open circuit or short to ground or short to power in harness or connectors.

## DTC P0325 KNOCK SENSOR (KS)

Diagnostic Procedure (Cont'd)

8	8 CHECK INTERMITTENT INCIDENT			
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	► INSPECTION END			

Component Description



#### **Component Description**

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0763

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-RPM (POS)	Tachometer: Connect Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

#### On Board Diagnosis Logic

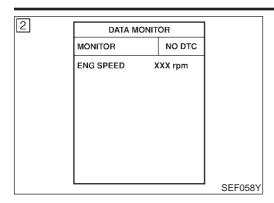
Malfunction is detected when 1° signal is not entered to ECM for the first few seconds during engine cranking, or 1° signal is not entered to ECM during engine running.

#### **Possible Cause**

NFEC0765

- Harness or connectors [The crankshaft position sensor (POS) circuit is open or shorted.]
- Crankshaft position sensor (POS)
- Starter motor (Refer to EL section.)
- Starting system circuit (Refer to EL section.)
- Dead (Weak) battery

DTC Confirmation Procedure



#### **DTC Confirmation Procedure**

NOTE:

NFEC0766

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V.

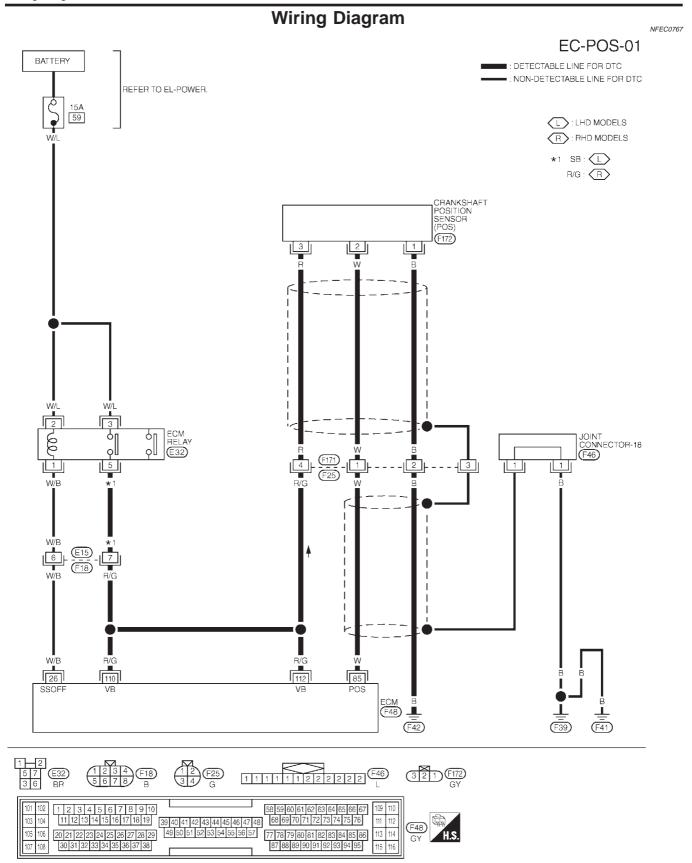
#### (P) WITH CONSULT-II

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- 2) Crank engine for at least two seconds.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-305.

**WITH GST** 

NFEC0766S02

Follow the procedure "With CONSULT-II" above.



Wiring Diagram (Cont'd)

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
QF.	w	CRANKSHAFT POSITION	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	(V) 10 5 0
85	VV	SENSOR (POS)	ENGINE RUNNING AT 2,000 RPM	(V) 10 5 0 10 0.4 ms

SEF856Y

## **Diagnostic Procedure**

1 RETIGHTEN GROUND SCREWS

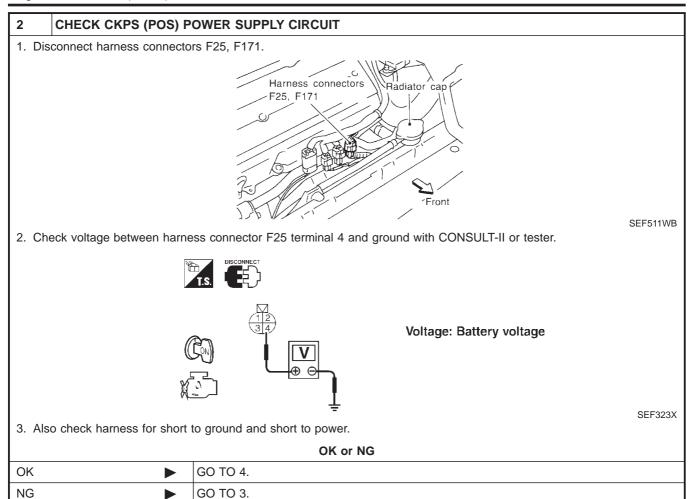
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

Engine ground

Oil filler cap

GO TO 2.

Diagnostic Procedure (Cont'd)



#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F25, F171
- Harness connectors E15, F18
- Harness for open or short between ECM and crankshaft position sensor (POS)
- Harness for open or short between ECM relay and crankshaft position sensor (POS)
  - Repair open circuit or short to ground or short to power in harness or connectors.

# 4 CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT 1. Check harness continuity between harness connector F25 terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power. OK or NG OK Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

#### 5 CHECK CKPS (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 85 and harness connector F25 terminal 1. Refer to Wiring Diagram.

#### Continuity should exist.

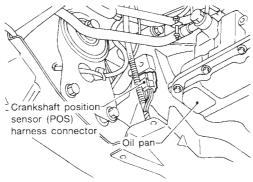
3. Also check harness for short to ground and short to power.

#### OK or NG

OK	<b>&gt;</b>	GO TO 6.
NG	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.

#### 6 CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF367Q

2. Check harness continuity between CKPS (POS) terminals and harness connector F171 terminals as follows.

CKPS (POS) terminal	Harness connector F171 terminal
1	2
2	1
3	4

MTBL0352

#### Continuity should exist.

3. Also check harness for short to ground and short to power.

#### OK or NG

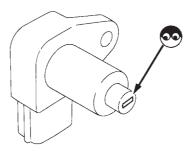
OK J		GO TO 7.
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

#### 7 **CHECK CKPS (POS) INSTALLATION** Check that CKPS (POS) and HO2S1 (front) (B2) harness clamp are installed correctly as shown below. Crankshaft position sensor (POS) -Heated oxygen sensor 1 (front) (B2) harness clamp 8.4 - 10.8 N·m 🗩 (0.86 - 1.10 kg-m, 74.6 - 95.5 in-lb) SEM222FB OK or NG GO TO 8. OK NG Install CKPS (POS) correctly.

Diagnostic Procedure (Cont'd)

#### 8 CHECK CRANKSHAFT POSITION SENSOR (POS)-I

- 1. Disconnect crankshaft position sensor (POS) harness connector.
- 2. Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.



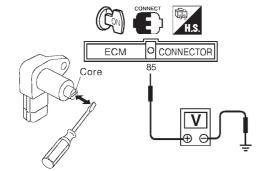
SEF587P

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u	n	or	N	u

OK J	GO TO 9.
NG J	Replace crankshaft position sensor (POS).

#### 9 CHECK CRANKSHAFT POSITION SENSOR (POS)-II

- 1. Reconnect disconnected harness connectors.
- 2. Turn ignition switch "ON".
- 3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdrivers



ECM terminal	l Condition Voltage	
85	Contacted	Approximately 5V
35	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF324X

#### OK or NG

OK •	GO TO 10.
NG ►	Replace crankshaft position sensor (POS).

#### 10 CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect harness connectors F25, F171.
- 2. Check harness continuity between harness connector F25 terminal 3 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

#### OK or NG

OK ►	GO TO 12.
NG ►	GO TO 11.

Diagnostic Procedure (Cont'd)

11	DETECT MALFUNCTIONING PART
TT	DETECT MALFUNCTIONING PART

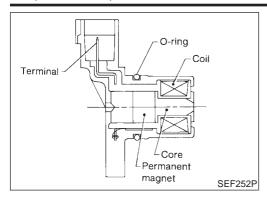
Check the following.

- Harness connectors F25, F171
- Joint connector-18
- Harness for open or short between harness connector F25 and engine ground

Repair open circuit or short to ground or short to power in harness or connectors.

12	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

Component Description



#### Component Description

The camshaft position sensor (PHASE) is located on the engine front cover facing the camshaft sprocket. It detects the cylinder No. signal.

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the camshaft sprocket will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is

The ECM receives the voltage signal and detects the cylinder No. signal.

#### On Board Diagnosis Logic

NFEC0199

Malfunction is detected when

(Malfunction A) the cylinder No. signal is not sent to ECM for the first few seconds during engine cranking,

(Malfunction B) the cylinder No. signal is not sent to ECM during engine running,

(Malfunction C) the cylinder No. signal is not in the normal pattern during engine running.

#### **Possible Cause**

NFFC0494

- Harness or connectors [The camshaft position sensor (PHASE) circuit is open or shorted.]
- Camshaft position sensor (PHASE)
- Starter motor (Refer to SC section.)
- Starting system circuit (Refer to SC section.)
- Dead (Weak) battery

#### **DTC Confirmation Procedure**

NFEC0200

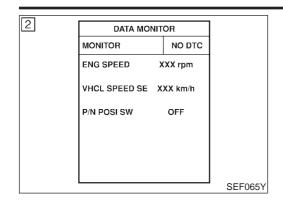
#### NOTE:

- Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND C".
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

DTC Confirmation Procedure (Cont'd)



#### PROCEDURE FOR MALFUNCTION A

#### (P) With CONSULT-II

1) Turn ignition switch "ON".

NFEC0200S01 NFEC0200S0101

- Select "DATA MONITOR" mode with CONSULT-II.
- 3) Crank engine for at least 2 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-313.

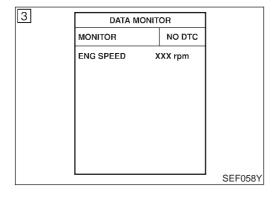
#### **With GST**

Follow the procedure "With CONSULT-II" above.

NFEC0200S0103

#### No Tools

- Crank engine for at least 2 seconds.
- Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-313.



#### PROCEDURE FOR MALFUNCTION B AND C

(P) With CONSULT-II

NFEC0200S02 NFEC0200S0201

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-313.
- With GST

NFEC0200S0203

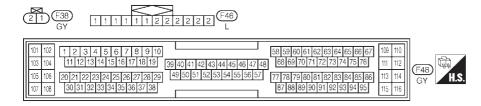
Follow the procedure "With CONSULT-II" above.

No Tools

NFEC0200S0202

- Start engine and run it for at least 2 seconds at idle speed. 1)
- Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-313.

# **Wiring Diagram** NFEC0201 EC-PHASE-01 CAMSHAFT POSITION SENSOR (PHASE) : DETECTABLE LINE FOR DTC -: NON-DETECTABLE LINE FOR DTC (F38) 1 JOINT CONNECTOR-18 F46 K W 76 PHASE (F42) (F39) (F41)



MEC046D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE ECM	'S TRANSIS	TOR. USE A GROUND OTHER	THAN ECM TERMINALS, SUCH AS THE GROUND.	
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
66 76	W W	CAMSHAFT POSITION SENSOR (PHASE)	ENGINE RUNNING AT IDLE SPEED	APPROX. 4.2V (AC RANGE)  (V) 40 20 0  10 ms

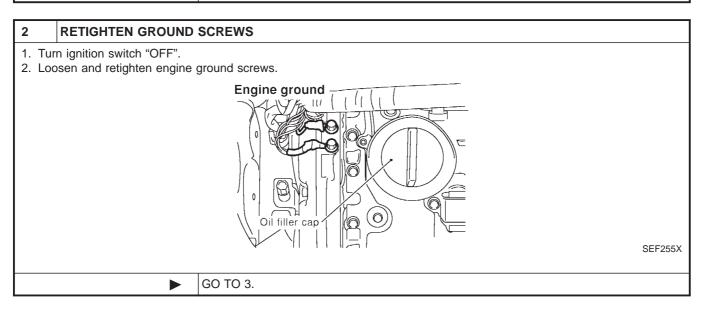
SEF857Y

Diagnostic Procedure

#### **Diagnostic Procedure**

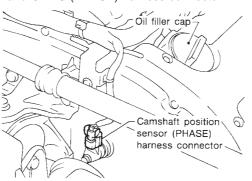
NFEC020

		NFEC0202	
1	1 CHECK STARTING SYSTEM		
Do	Turn ignition switch to "START" position.  Does the engine turn over?  Does the starter motor operate?		
	Yes or No		
Yes	<b>&gt;</b>	GO TO 2.	
No	<b>•</b>	Check starting system. (Refer to SC-12, "STARTING SYSTEM".)	



#### 3 CHECK CMPS (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector and CMPS (PHASE) harness connector.



SEF274F

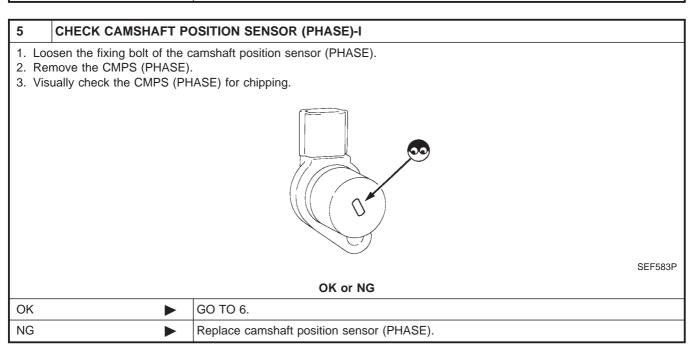
- 3. Check harness continuity between CMPS (PHASE) terminal 2 and ECM terminals 66, 76. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

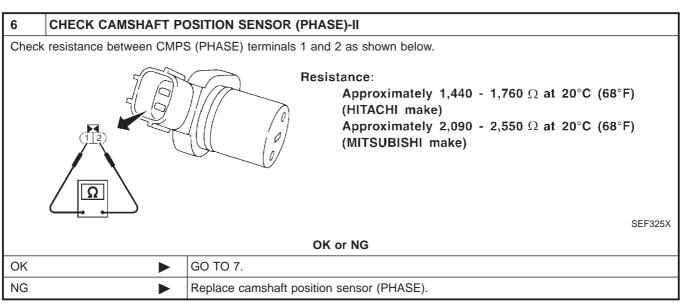
OK or NG

OK ►	GO TO 4.
NG •	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK CMPS (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT		
Check harness continuity between CMPS (PHASE) terminal 1 and engine ground.     Continuity should exist.     Also check harness for short to ground and short to power.			
	OK or NG		
OK	<b>&gt;</b>	GO TO 5.	
NG	<b>&gt;</b>	Repair open circuit or short to ground or short to power in harness or connector.	





Diagnostic Procedure (Cont'd)

#### CHECK CMPS (PHASE) SHIELD CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch "OFF". 2. Disconnect joint connector-18. 3. Check the following. • Continuity between joint connector terminal 1 and ground Joint connector (Refer to EL-319, "HARNESS LAYOUT".) Continuity should exist. 4. Also check harness for short to ground and short to power. 5. Then reconnect joint connector-18. OK or NG GO TO 8. OK NG

8	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	<b>•</b>	INSPECTION END

Repair open circuit or short to ground or short to power in harness or connectors.

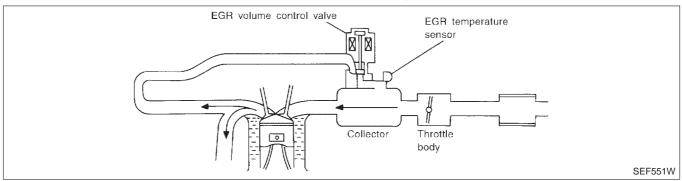
# **Description SYSTEM DESCRIPTION**

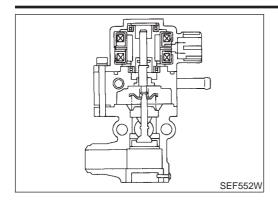
NFEC0769 NFEC0769S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Vehicle speed sensor	Vehicle speed	]	
Engine coolant temperature sensor	Engine coolant temperature	]	
Ignition switch	Start signal	]	
Throttle position sensor	Throttle position	]	
Battery	Battery voltage	EGR volume control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Air conditioner switch	Air conditioner operation	]	
Power steering oil pressure switch	Power steering load signal	]	
Electrical load	Electrical load signal	1	
PNP switch	Park/Neutral position signal	1	
TCM (Transmission Control Module)	Gear position, shifting signal	1	

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage





# COMPONENT DESCRIPTION EGR volume control valve

NFEC0769S02

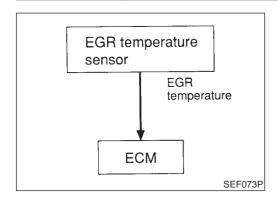
The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0770

MONITOR ITEM	CONE	SPECIFICATION	
EGR TEMP SEN	Engine: After warming up	Less than 4.5V	
EGR VOL CON/V	Engine: After warming up     Air conditioner switch: "OFF"	Idle	0 step
	Shift lever: "N"     No-load	Revving engine up to 3,000 rpm quickly	10 - 55 step



#### On Board Diagnosis Logic

NEECOTT

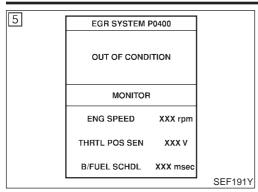
If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

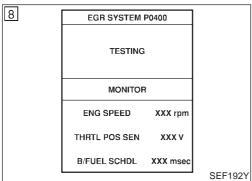
Malfunction is detected when no EGR flow is detected under condition that calls for EGR.

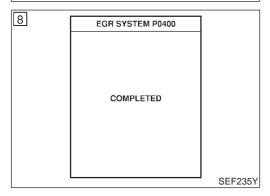
#### **Possible Cause**

NFEC0772

- Harness or connectors (EGR volume control valve circuit is open or shorted.)
- EGR volume control valve stuck closed
- Dead (Weak) battery
- EGR passage clogged
- EGR temperature sensor and circuit
- Exhaust gas leaks







#### **DTC Confirmation Procedure**

CAUTION:

Always drive vehicle at a safe speed.

#### NOTE:

- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
- P0400 will not be displayed at "SELF-DIAG RESULTS" mode with CONSULT-II even though DTC work support test result is NG.

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm battery voltage is more than 10V at idle, then stop engine immediately.
- For best results, perform the test at a temperature of 5°C (41°F) or higher.

#### (P) WITH CONSULT-II

NEEC0773S01

NFEC0773

- Turn ignition switch "OFF" and wait at least 10 seconds.
- 2) Turn ignition switch "ON"
- 3) Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-II.

Confirm COOLAN TEMP/S value is within the range listed below.

#### COOLAN TEMP/S: Less than 40°C (104°F)

If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the engine coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

- 4) Start engine and let it idle monitoring "COOLAN TEMP/S" value. When the "COOLAN TEMP/S" value reaches 60°C (140°F), immediately go to the next step.
- 5) Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 6) Touch "START".
- 7) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running.
  - If "COMPLETED" appears on CONSULT-II screen, go to step
  - If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
- 8) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions until "TESTING" changes to "COMPLETED". (It will take approximately 30 seconds or more.)

ENG SPEED	1,200 - 2,400 rpm
Vehicle speed	Suitable speed
B/FUEL SCHDL	More than 4 msec
THRTL POS SEN	0.65 - 1.08V
Selector lever	Suitable position

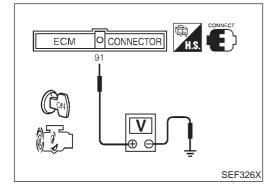
If "TESTING" is not displayed after 5 minutes, retry from step 2.

9) Make sure that "OK" is displayed after touching "SELF-DIAG

#### **DTC P0400 EGR FUNCTION (CLOSE)**

DTC Confirmation Procedure (Cont'd)

RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-321.



#### WITH GST

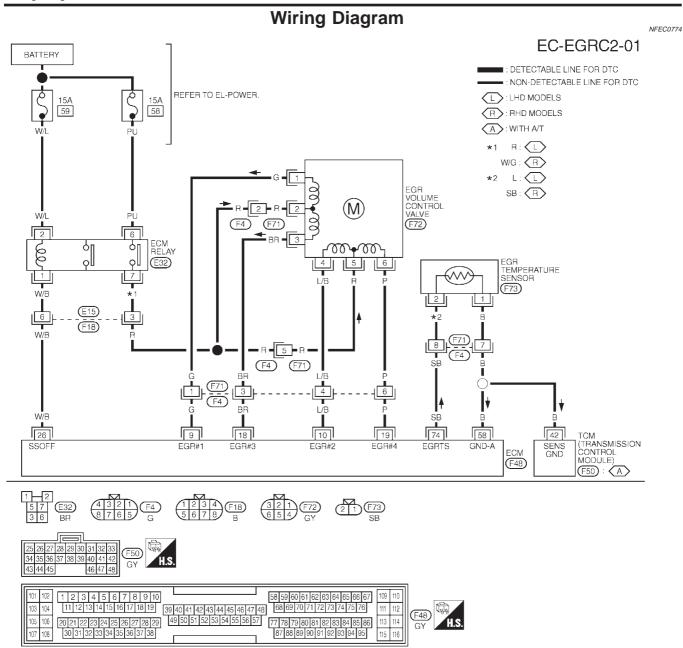
NFEC0773S02

- 1) Turn ignition switch "OFF" and wait at least 10 seconds.
- 2) Turn ignition switch "ON".
- 3) Check engine coolant temperature in MODE 1 with GST. Engine coolant temperature: Less than 40°C (104°F)

  If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.
- 4) Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 60°C (140°F), immediately go to the next step.
- 5) Maintain the following conditions for at least 1 minute.

Engine speed: 1,200 - 2,400 rpm
Vehicle speed: Suitable speed
Voltage between ECM terminal 91 and ground: 0.65 - 1.08V
Selector lever: Suitable position

- 6) Stop vehicle.
- 7) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
- 8) Repeat step 3 to 5.
- 9) Select "MODE 3" with GST.
- 10) If DTC is detected, go to "Diagnostic Procedure", EC-321.
- When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.



MEC852C

## ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

				•	
- [	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	9	G			
١	10	L/B	EGR VOLUME CONTROL VALVE	ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
١	18	BR			0.1 - 140
- 1	19	Р			1

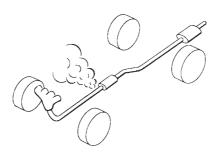
SEF666XB

#### **Diagnostic Procedure**

NFEC0775

#### 1 CHECK EXHAUST SYSTEM

- 1. Start engine.
- 2. Check exhaust pipes and muffler for leaks.



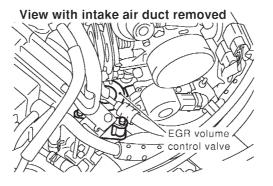
SEF099P

OK or NG

ОК	<b>&gt;</b>	GO TO 2.
NG	<b>•</b>	Repair or replace exhaust system.

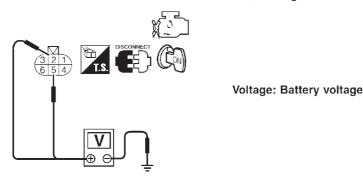
#### 2 CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT

1. Disconnect EGR volume control vale harness connector.



SEF265X

- 2. Turn ignition switch "ON".
- 3. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



SEF327X

OK or NG

OK •	GO TO 4.
NG •	GO TO 3.

#### **DTC P0400 EGR FUNCTION (CLOSE)**

Diagnostic Procedure (Cont'd)

#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness connectors F4, F71
- Harness for open or short between ECM relay and EGR volume control valve

Repair harness or connectors.

#### 4 CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
9	1
10	4
18	3
19	6

MTBL0356

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK •	GO TO 6.
NG ►	GO TO 5.

#### 5 DETECT MALFUNCTIONING PART

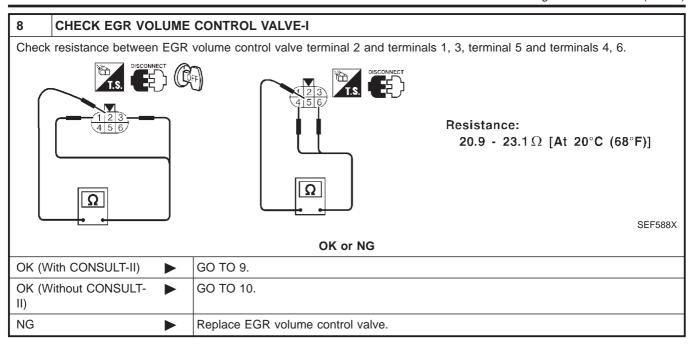
Check the following.

- Harness connectors F4, F71
- Harness for open or short between ECM and EGR volume control valve

Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK EGR PASSAGE	
Check EGR passage for clogging and cracks.		
OK or NG		
OK	<b>&gt;</b>	GO TO 7.
NG	<b>•</b>	Repair or replace EGR passage.

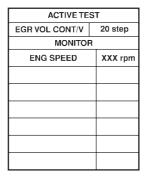
7	CHECK EGR TEMPERATURE SENSOR AND CIRCUIT		
Refer to "DTC Confirmation Procedure" under "DTC P1401 EGR TEMPERATURE SENSOR", EC-417.			
OK or NG			
OK	<b>&gt;</b>	GO TO 8.	
NG	<b>•</b>	Replace EGR temperature sensor.	

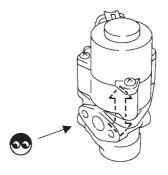


#### 9 CHECK EGR VOLUME CONTROL VALVE-II

#### With CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch "ON".
- 4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening steps.





SEF067Y

OK	or	NG
UN	OI.	ING

OK		GO TO 11.
NG	<b></b>	Replace EGR volume control valve.

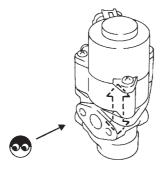
#### **DTC P0400 EGR FUNCTION (CLOSE)**

Diagnostic Procedure (Cont'd)

#### 10 CHECK EGR VOLUME CONTROL VALVE-II

#### **⋈** Without CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch "ON" and "OFF".
- 4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



SEF560W

OK or NG

OK ▶	GO TO 11.
NG ▶	Replace EGR volume control valve.

11	CHECK INTERMITTENT INCIDENT			
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.				
	<b>&gt;</b>	INSPECTION END		

Description

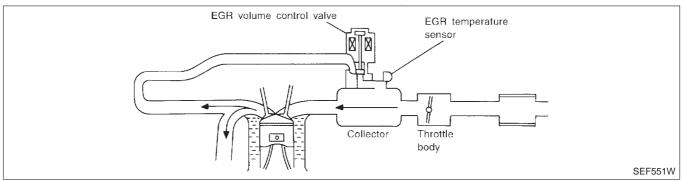
# **Description SYSTEM DESCRIPTION**

NFEC0776 NFEC0776S01

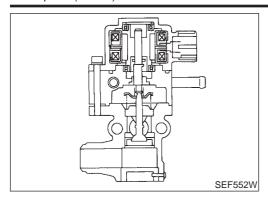
Sensor	Input Signal to ECM	ECM function	Actuator		
Crankshaft position sensor (POS)	Engine speed (POS signal)				
Crankshaft position sensor (REF)	Engine speed (REF signal)				
Vehicle speed sensor	Vehicle speed				
Engine coolant temperature sensor	Engine coolant temperature				
Ignition switch	Start signal				
Throttle position sensor	Throttle position				
Battery	Battery voltage	EGR volume con- trol	EGR volume control valve		
Mass air flow sensor	Amount of intake air				
Air conditioner switch	Air conditioner operation				
Power steering oil pressure switch	Power steering load signal				
Electrical load	Electrical load signal				
PNP switch	Park/Neutral position signal				
TCM (Transmission Control Module)	Gear position, shifting signal				

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage



Description (Cont'd)



#### **COMPONENT DESCRIPTION**

#### EGR volume control valve

NFEC0776S02

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

NFEC0777

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	Engine: After warming up		Less than 4.5V
	Engine: After warming up     Air conditioner switch: "OFF"	Idle	0 step
EGR VOL CON/V	Shift lever: "N"     No-load	Revving engine up to 3,000 rpm quickly	10 - 55 step

#### On Board Diagnosis Logic

NFFC0778

Malfunction is detected when an improper voltage signal is sent to ECM through the valve.

#### **FAIL-SAFE MODE**

NFEC0778S01

When the ECM enters the fail-safe mode, the MI illuminates.

Detected items	Engine operating condition in fail-safe mode
EGR volume control valve circuit	Engine speed will not rise more than 2,800 rpm due to the fuel cut.

#### **Possible Cause**

NFEC0779

- Harness or connectors (EGR volume control valve circuit is open or shorted.)
- EGR volume control valve

#### **DTC Confirmation Procedure**

NFEC0780

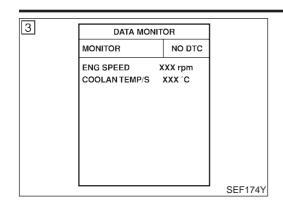
NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

DTC Confirmation Procedure (Cont'd)



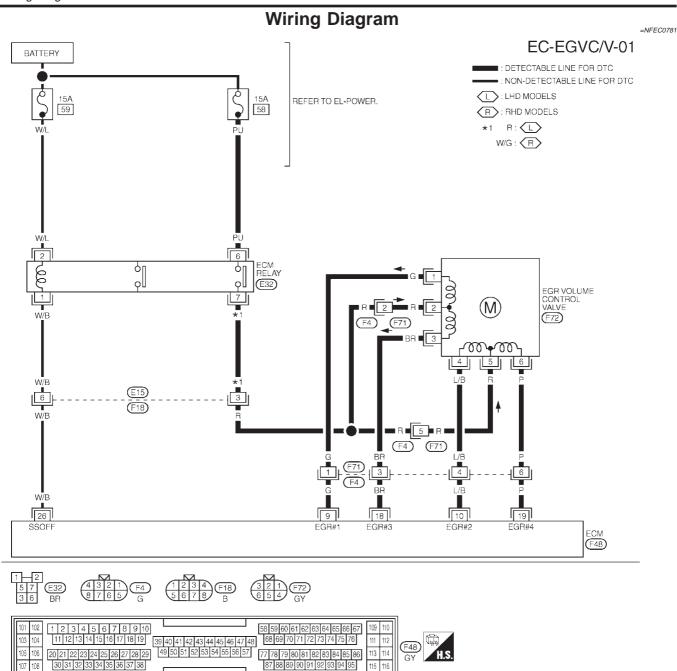
#### (P) WITH CONSULT-II

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Rev engine from idle to 2,000 rpm 10 times.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-329.

#### **WITH GST**

Follow the procedure "With CONSULT-II" above.

NFEC0780S02



MEC001D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
9	G			
10		EGR VOLUME CONTROL	  ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
18	BR	VALVE	LIVATIVE NOTIVITIVA AT TIDEE STEED	U.1 - 14V
19	Р			

SEF666XB

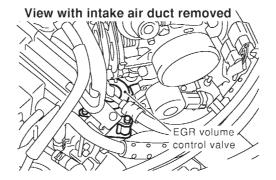
Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0782

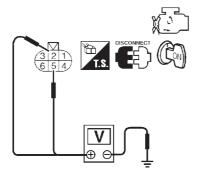
#### 1 CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT

1. Disconnect EGR volume control valve harness connector.



SEF265X

- 2. Turn ignition switch "ON".
- 3. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF327X

OK or NG

OK	<b>•</b>	GO TO 3.
NG	<b>•</b>	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness connectors F4, F71
- Harness for open or short between ECM relay and EGR volume control valve

Repair harness or connectors.

Diagnostic Procedure (Cont'd)

#### 3 CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
9	1
10	4
18	3
19	6

MTBL0356

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

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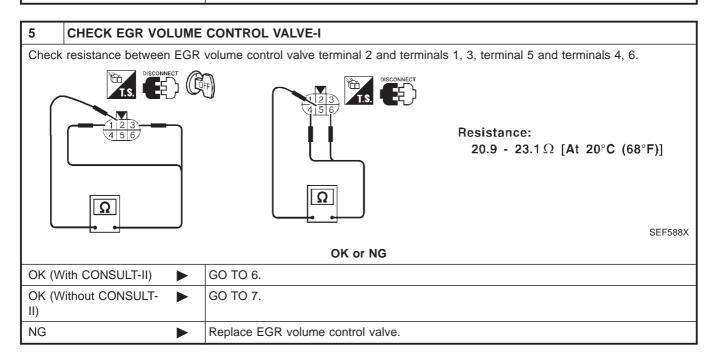
OK •	GO TO 5.
NG •	GO TO 4.

#### 4 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F4, F71
- Harness for open or short between ECM and EGR volume control valve

Repair open circuit or short to ground or short to power in harness or connectors.



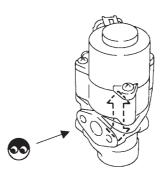
Diagnostic Procedure (Cont'd)

#### 6 CHECK EGR VOLUME CONTROL VALVE-II

#### (P) With CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch "ON".
- 4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Check that EGR volume control valve shaft moves smoothy forward and backward according to the valve opening steps.

ACTIVE TEST		
EGR VOL CONT/V	20 step	
MONITOR	ì	
ENG SPEED	XXX rpm	
_		



SEF067Y

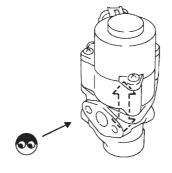
			_
OK	or	Ν	G

OK ►	GO TO 8.
NG ►	Replace EGR volume control valve.

#### 7 CHECK EGR VOLUME CONTROL VALVE-II

#### Without CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch "ON" and "OFF".
- 4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



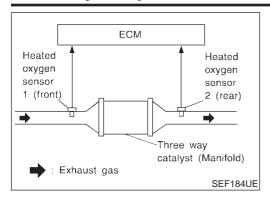
SEF560W

OK or NG

OK •	GO TO 8.
NG ►	Replace EGR volume control valve.

8	CHECK INTERMITTENT INCIDENT			
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	► INSPECTION END			

On Board Diagnosis Logic



#### On Board Diagnosis Logic

The ECM monitors the switching frequency ratio of heated oxygen sensor 1 (front) and heated oxygen sensors 2 (rear).

A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2 (rear). As oxygen storage capacity decreases, the heated oxygen sensor 2 (rear) switching frequency will increase.

When the frequency ratio of heated oxygen sensor 1 (front) and heated oxygen sensor 2 (rear) approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.

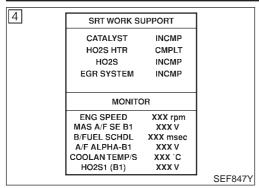
Malfunction is detected when three way catalyst (Manifold) does not operate properly, three way catalyst (Manifold) does not have enough oxygen storage capacity.

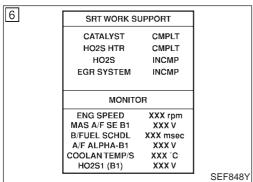
#### Possible Cause

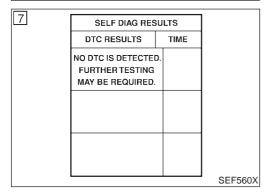
NFEC0784

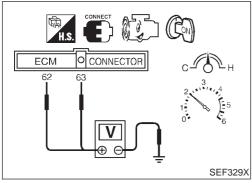
- Three way catalyst (Manifold)
- Exhaust tube
- Intake air leaks
- Injectors
- Injector leaks
- Spark plug
- Improper ignition timing

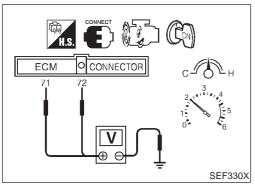
Possible Cause (Cont'd)











### **DTC Confirmation Procedure**NOTE:

NFEC0785

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### (P) WITH CONSULT-II

NFEC0785S01

#### **TESTING CONDITION:**

- Open engine hood before conducting the following procedure.
- Do not hold engine speed for more than the specified minutes below.
- 1) Turn ignition switch "ON".
- 2) Select "DTC & SRT CONFIRMATION" then "SRT WORK SUP-PORT" mode with CONSULT-II.
- 3) Start engine.
- 4) Rev engine up to 3,000±500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
- Wait 5 seconds at idle.
- 6) Rev engine up to 2,500±500 rpm and maintain it until "INCMP" of CATALYST changes to "CMPLT" (It will take approximately 5 minutes).
  - If not "CMPLT", stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.
- 7) Select "SELF-DIAG RESULTS" mode with CONSULT-II.
- 8) Confirm that the 1st trip DTC is not detected. If the 1st trip DTC is detected, go to "Diagnostic Procedure", EC-334.

#### **Overall Function Check**

NFEC078

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a 1st trip DTC might not be confirmed.

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### **WITH GST**

NFEC0786S01

- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeters probes between ECM terminals 63 (HO2S1 bank 1 signal), 62 (HO2S1 bank 2 signal) and engine ground, and ECM terminals 72 (HO2S2 bank 1 signal), 71 (HO2S2 bank 2 signal) and engine ground.
- 4) Keep engine speed at 2,000 rpm constant under no load.
- 5) Make sure that the voltage switching frequency (high & low) between ECM terminals 72 and engine ground, or 71 and engine ground is very less than that of ECM terminals 63 and engine ground, or 62 and engine ground.

Switching frequency ratio = A/B

A: Heated oxygen sensor 2 (rear) voltage switching frequency

Overall Function Check (Cont'd)

B: Heated oxygen sensor 1 (front) voltage switching frequency

This ratio should be less than 0.75.

If the ratio is greater than above, it means three way catalyst (Manifold) does not operate properly. Go to "Diagnostic Procedure", EC-334.

#### NOTE:

If the voltage at ECM terminal 62 or 63 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-191.)

#### **Diagnostic Procedure**

NFEC0787

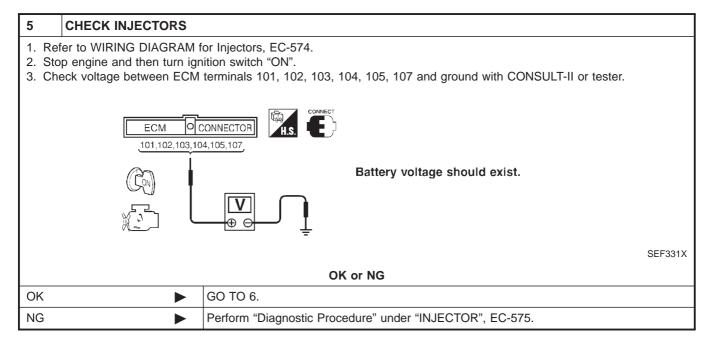
1	CHECK EXHAUST SYSTEM			
Visually check exhaust tubes and muffler for dent.				
OK or NG				
OK ▶ GO TO 2.				
NG	<b>•</b>	Repair or replace.		

# 2 CHECK EXHAUST AIR LEAK 1. Start engine and run it at idle. 2. Listen for an exhaust air leak before the three way catalyst (Manifold). SEF099P OK or NG OK Repair or replace.

3	CHECK INTAKE AIR LEAK			
Listen	Listen for an intake air leak after the mass air flow sensor.			
	OK or NG			
OK	<b>&gt;</b>	GO TO 4.		
NG	<b>&gt;</b>	Repair or replace.		

Diagnostic Procedure (Cont'd)

4	CHECK IGNITION TIMING				
Checl	Check the following items. Refer to "Basic Inspection", EC-92.				
		Items	Specifications		
		Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)		
		Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF		
		Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)		
				MTBL0623	
	OK or NG				
OK	<b>•</b>	GO TO 5.			
NG	<b>&gt;</b>	Follow the "Basic Insp	pection".		



Diagnostic Procedure (Cont'd)

# 6 CHECK IGNITION SPARK 1. Turn ignition switch "OFF". 2. Disconnect ignition coil assembly from rocker cover. 3. Connect a known-good spark plug to the ignition coil assembly. 4. Place end of spark plug against a suitable ground and crank engine. 5. Check for spark. SEF575Q OK or NG OK GO TO 7. NG Check ignition coil with power transistor and their circuit. Refer to "IGNITION SIGNAL", EC-545.

7	CHECK INJECTOR			
2. Re Re Ke 3. Dis 4. Tur	1. Turn ignition switch "OFF".  2. Remove injector assembly. Refer to EC-38. Keep fuel hose and all injectors connected to injector gallery.  3. Disconnect all ignition coil harness connectors.  4. Turn ignition switch "ON". Make sure fuel does not drip from injector.			
	OK or NG			
OK (D	OK (Does not drip.)  GO TO 8.			
NG (D	NG (Drips.) Replace the injector(s) from which fuel is dripping.			

8	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
Trouble	Trouble is fixed.		INSPECTION END
Trouble	e is not fixed.	<b>&gt;</b>	Replace three way catalyst (Manifold).

Description

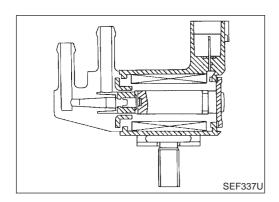
# Description SYSTEM DESCRIPTION

NFEC0788

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		EVAP canister purge vol- ume control solenoid valve
Ignition switch	Start signal	EVAP canister	
Throttle position sensor	Throttle position	purge flow con-	
Throttle position switch	Closed throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		

Vehicle speed

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



Vehicle speed sensor

#### **COMPONENT DESCRIPTION**

NFEC0788S0

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0789

MONITOR ITEM	COND	SPECIFICATION	
PURG VOL C/V	<ul><li>Engine: After warming up</li><li>Air conditioner switch "OFF"</li></ul>	Idle (Vehicle stopped)	0%
FORG VOL C/V	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	_

On Board Diagnosis Logic

#### On Board Diagnosis Logic

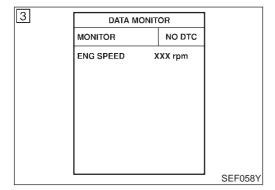
EECOZOO

Malfunction is detected when an improper voltage signal is sent to ECM through the valve.

#### **Possible Cause**

NFEC0791

- Harness or connectors (The valve circuit is open or shorted.)
- EVAP canister purge volume control solenoid valve



#### **DTC Confirmation Procedure**

NFEC0792

#### IOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

#### (P) WITH CONSULT-II

NFEC0792S01

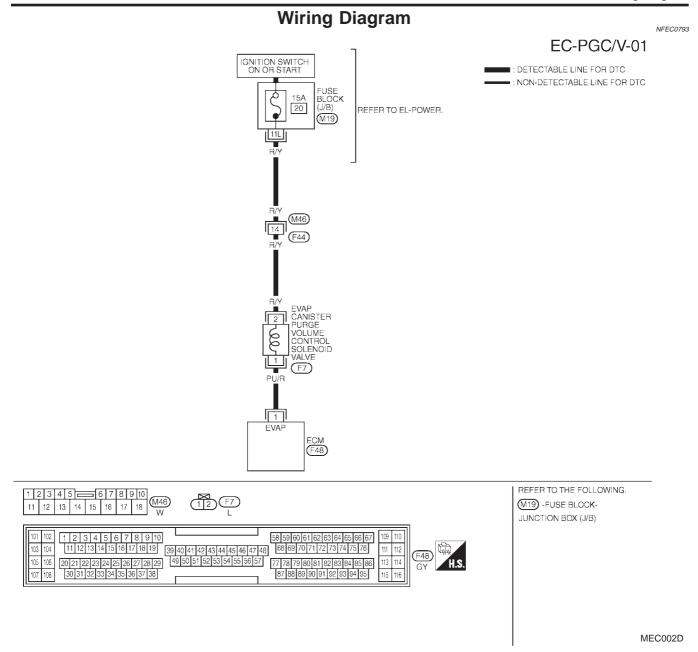
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and let it idle for at least 13 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.

#### **WITH GST**

NFEC0792S02

Follow the proocedure "WITH CONSULT-II" above.

Wiring Diagram



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	1	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	ENGINE RUNNING AT IDLE SPEED	(V) 40 20 0 50 ms
1			ENGINE RUNNING AT 2,000 RPM (MORE THAN 100 SECONDS AFTER STARTING ENGINE)	BATTERY VOLTAGE  (V) 40 20 0 50 ms

SEF858Y

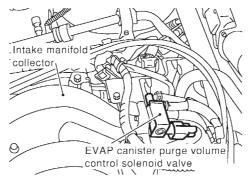
Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0794

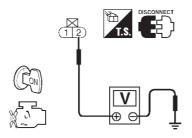
#### 1 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF266X

- 3. Turn ignition switch "ON".
- 4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF333X

OK or NG

OK •	GO TO 3.
NG ►	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse
  - Repair harness or connectors.

Diagnostic Procedure (Cont'd)

#### CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT 3 FOR OPEN AND SHORT 1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 1 and EVAP canister purge volume control solenoid valve terminal 1. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power. OK or NG OK (With CONSULT-II) GO TO 4. OK (Without CONSULT-GO TO 5. II)

# Repair open circuit or short to ground and short to power in harness or connetors. 4 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION With CONSULT-II Start engine. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that engine speed varies according

to the valve opening.

_				
Γ	ACTIVE TES	Т		
F	PURG VOL CONT/V XXX %			
	MONITOR			
	ENG SPEED	XXX rpm		
	A/F ALPHA-B1	XX %		
	A/F ALPHA-B2	XX %		
	HO2S1 MNTR (B1)	LEAN		
	HO2S1 MNTR (B2)	LEAN		
	THRTL POS SEN	X. XX V		

SEF677Y

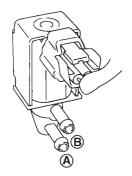
	OK or NG		
0	K •	GO TO 6.	
N	G ▶	GO TO 5.	

Diagnostic Procedure (Cont'd)

#### CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### (P) With CONSULT-II

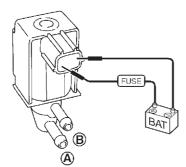
Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

Without CONSULT-II
Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

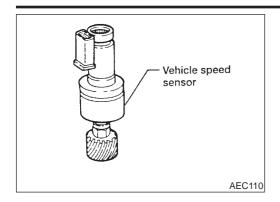
#### OK or NG

OK I	<b>\</b>	GO TO 6.
NG	<b>▼</b>	Replace EVAP canister purge volume control solenoid valve.

6	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	INSPECTION END	

#### DTC P0500 VEHICLE SPEED SENSOR (VSS)

Component Description



#### **Component Description**

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

#### On Board Diagnosis Logic

NFEC0796

Malfunction is detected when the almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.

#### **Possible Cause**

NFEC0797

- Harness or connector (The vehicle speed sensor circuit is open or shorted.)
- Vehicle speed sensor

#### **DTC Confirmation Procedure**

NFFC0798

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

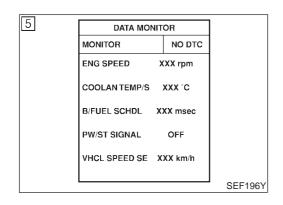
#### (P) WITH CONSULT-II

NFEC0798S01

- 1) Start engine (TCS switch "OFF").
- Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

If NG, go to "Diagnostic Procedure", EC-346. If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT-II.
- Warm engine up to normal operating temperature.



#### DTC P0500 VEHICLE SPEED SENSOR (VSS)

DTC Confirmation Procedure (Cont'd)

5) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	1,400 - 2,400 rpm (A/T) 1,900 - 3,000 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	4 - 8 msec (A/T) 4.8 - 9 msec (M/T)
Selector lever	Suitable position
PW/ST SIGNAL	OFF

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-346.

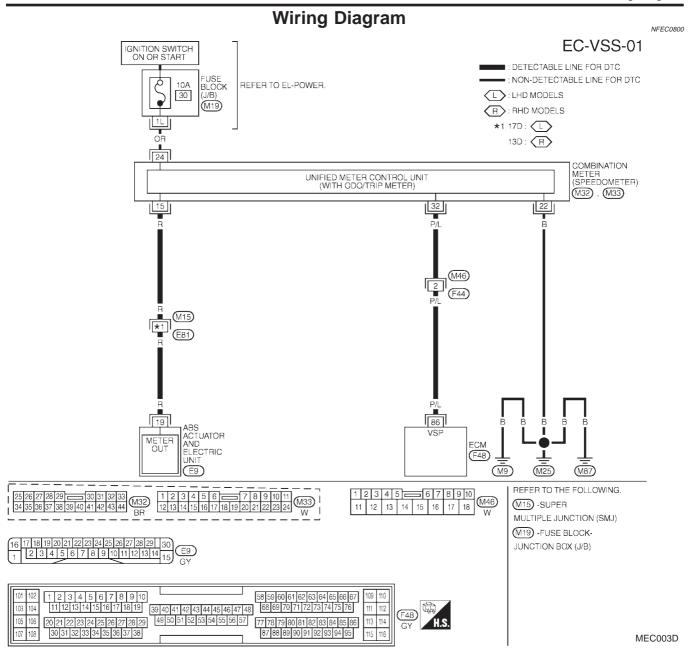
#### **Overall Function Check**

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

#### **WITH GST**

NFEC0799S01

- 1) Lift up drive wheels.
- 2) Start engine.
- 3) Read vehicle speed sensor signal in "MODE 1" with GST. The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
- 4) If NG, go to "Diagnostic Procedure", EC-346.



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
86	P/L	VEHICLE SPEED SENSOR	VEHICLE DRIVING AT 10 KM/H (6 MPH) IN 1ST GEAR POSITION UNDER LIFTED UP CONDITION	APPROX. 2.0V  (V) 10 5 0 100 ms
80	P/L		VEHICLE DRIVING AT 30 KM/H (19 MPH) IN 2ND GEAR POSITION UNDER LIFTED UP CONDITION	(V) 10 5 0

SEF859Y

#### **Diagnostic Procedure**

NFEC0801

#### 1 CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector and combination meter harness connector.
- Check harness continuity between ECM terminal 86 and combination meter terminal 32. Refer to Wiring Diagram.

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

OK	<b>•</b>	GO TO 3.
NG	<b>•</b>	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Harness for open or short between ECM and combination meter

Repair open circuit or short to ground or short to power in harness or connectors.

#### 

# 4 CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT Check the following. ■ Harness connectors M15, E81 ■ Harness for open or short between combination meter and ABS actuator and electric unit OK or NG OK ■ Check combination meter and ABS actuator and electric unitr. Refer to EL or BR section. NG Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	

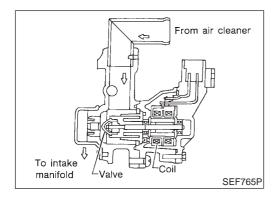
Description

# Description SYSTEM DESCRIPTION

NFEC0802 NFEC0802S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		LACVAAC valva
Park/neutral position (PNP) switch	Park/neutral position		
Air conditioner switch	Air conditioner operation	Idle air control	IACV-AAC valve
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		
Ambient air temperature switch	Ambient air temperature		
Intake air temperature sensor	Intake air temperature		
Absolute pressure sensor	Ambient barometic pressure		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).



### COMPONENT DESCRIPTION IACV-AAC Valve

NFEC0802S02

NEECONOCCO

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in sequence. Each time the IACV-AAC valve opens or closes to change tha auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

CONSULT-II Reference Value in Data Monitor Mode

# **CONSULT-II** Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0803

MONITOR ITEM	COND	SPECIFICATION	
Engine: After warming up     Air conditioner switch: "OFF"	Idle	2 - 10 step	
IACV-AAC/V	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	_

#### **On Board Diagnosis Logic**

NFEC0804

Malfunction is detected when

(Malfunction A) the IACV-AAC valve does not operate properly, (Malfunction B) the IACV-AAC valve does not operate properly.

# Possible Cause MALFUNCTION A

NFEC0805

NFEC0805S01

- Harness or connectors (The IACV-AAC valve circuit is open.)
- IACV-AAC valve

#### MALFUNCTION B

NFEC0805S02

- Harness or connectors (The IACV-AAC valve circuit is shorted.)
- Air control valve (Power steering)
- IACV-AAC valve

#### **DTC Confirmation Procedure**

NFEC0806

- NOTE:
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
- Perform "Idle air Volume Learning", EC-41, before conducting "DTC Confirmation Procedure", if the engine idle speed is out of the specified value. Refer to SDS, EC-609.
- Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".

#### PROCEDURE FOR MALFUNCTION A

**TESTING CONDITION:** 

NFEC0806S01

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch "ON".

#### (P) With CONSULT-II

NFEC0806S0101

- Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and let it idle.
- 4) Keep engine speed at 2,500 rpm for three seconds, then let it idle for three seconds.

Do not rev engine to more than 3,000 rpm.

DATA MONITOR
MONITOR
NO DTC
ENG SPEED XXX rpm

SEF058Y

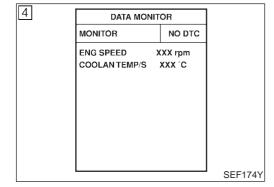
DTC Confirmation Procedure (Cont'd)

- 5) Perform step 4 once more.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-351.

#### With GST

NFEC0806S0102

Follow the procedure "With CONSULT-II" above.



#### PROCEDURE FOR MALFUNCTION B

NFFC0806S02

#### **TESTING CONDITION:**

- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.
- Always perform the test at a temperature above -10°C (14°F).

#### (P) With CONSULT-II

NFEC0806S0201

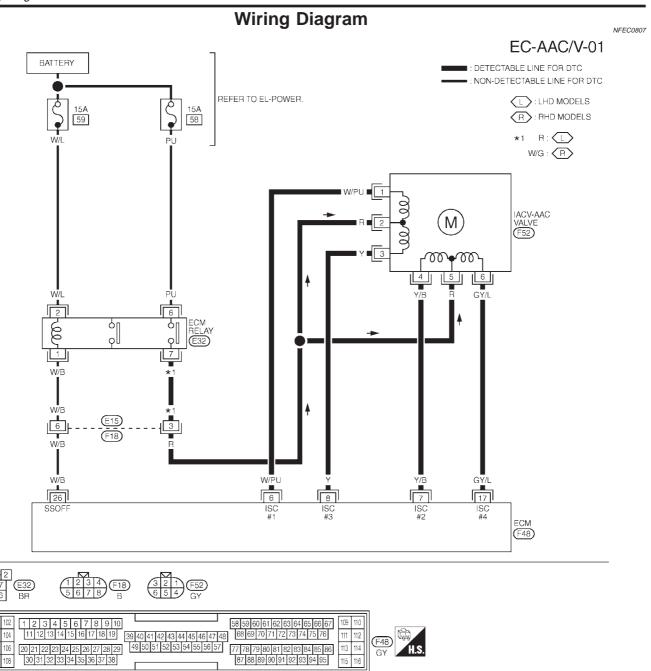
- 1) Open engine hood.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT-II
- 5) Start engine and run it for at least 1 minute at idle speed.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-351.

#### **With GST**

NFEC0806S0202

Follow the procedure "With CONSULT-II" above.

Wiring Diagram



MEC004D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
6	W/PU			
7	Y/B	IACV-AAC VALVE	ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
8	Υ	IACV-AAC VALVE	ENGINE ROMNING AT TOLE SPEED	0.1 - 140
17	GY/L			

SEF625XB

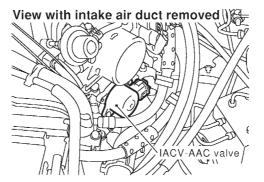
Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0808

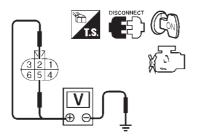
#### 1 CHECK IACV-AAC VALVE POWER SUPPLY CIRCUIT

- 1. Stop engine.
- 2. Disconnect IACV-AAC valve harness connector.



SEF269X

- 3. Turn ignition switch "ON".
- 4. Check voltage between IACV-AAC valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF343X

OK or NG

OK •	GO TO 3.
NG ►	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness for open or short between IACV-AAC valve and ECM relay

Repair harness or connectors.

Diagnostic Procedure (Cont'd)

3

#### CHECK IACV-AAC VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminals and IACV-AAC valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	IACV-AAC valve terminal
6	1
7	4
8	3
17	6

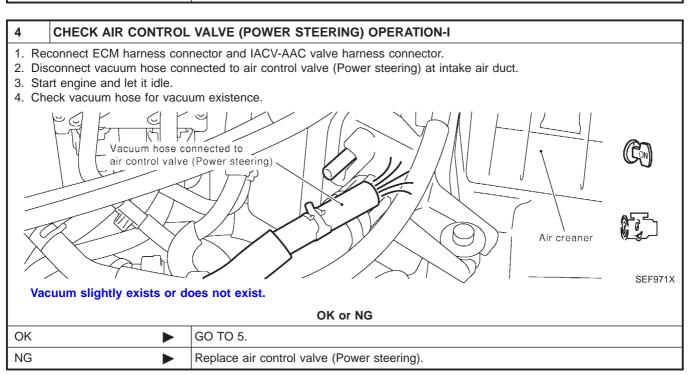
MTBL0354

#### Continuity should exist.

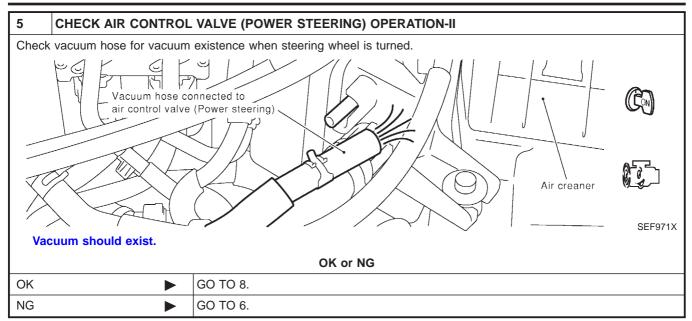
4. Also check harness for short to ground and short to power.

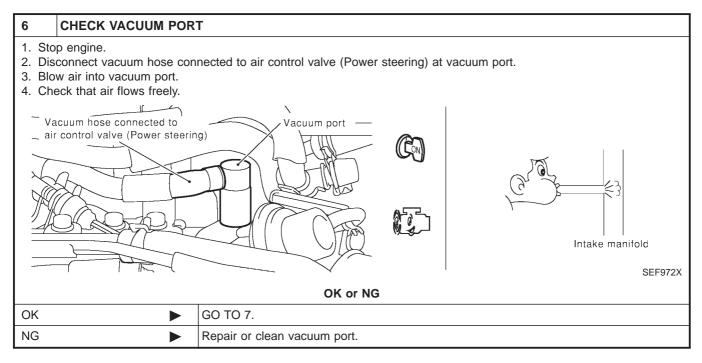
	-	_			_
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	OK	<b></b>	GO TO 4.
1	NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.



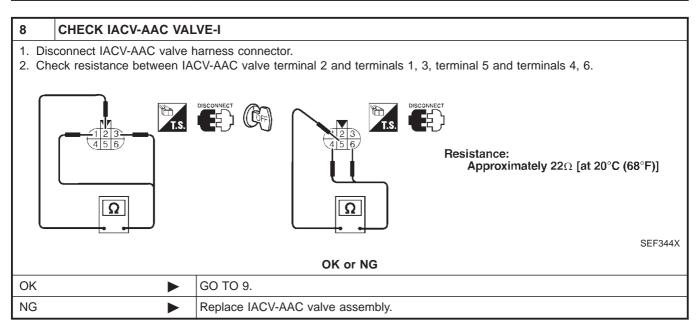
Diagnostic Procedure (Cont'd)





Diagnostic Procedure (Cont'd)

#### 

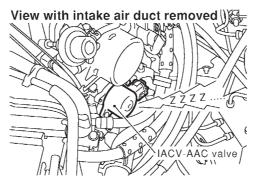


Diagnostic Procedure (Cont'd)

#### 9 CHECK IACV-AAC VALVE-II

1. Reconnect IACV-AAC valve harness connector and ECM harness connector.

2. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve makes operating sound according to the ignition switch position.



SEF589X

#### OK or NG

ОК		GO TO 11.
NG	<b>•</b>	GO TO 10.

#### 10 REPLACE IACV-AAC VALVE

- 1. Replace IACV-AAC valve assembly.
- 2. Perform "Idle Air Volume Learning", EC-41.

Is the result CMPLT or INCMP?

#### **CMPLT or INCMP**

CMPLT -	INSPECTION END
INCMP -	Follow the construction of "Idle Air Volume Learning".

#### 11 CHECK TARGET IDLE SPEED

- 1. Turn ignition switch "OFF".
- 2. Reconnect all harness connectors and vacuum hoses.
- 3. Start engine and warm it up to normal operating temperature.
- 4. Also warm up transmission to normal operating temperature.
- For A/T models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
- For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.
- 5. Stop vehicle with engine running.
- 6. Check target idle speed.

M/T: 625±50 rpm (VQ30DE engine models)

M/T: 675±50 rpm (VQ20DE engine models)

A/T: 700±50 rpm (in "P" or "N" position)

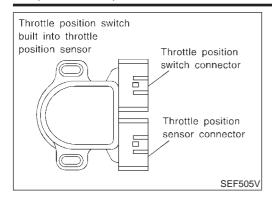
#### OK or NG

OK •	GO TO 12.
NG ▶	Perform "Idle Air Volume Learning", EC-41.

12	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	

#### DTC P0510 CLOSED THROTTLE POSITION SWITCH

#### Component Description



#### **Component Description**

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.

When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0810

MONITOR ITEM	CONDITION		SPECIFICATION
	Engine: After warming up, idle	Throttle valve: Idle position	ON
	the engine	Throttle valve: Slightly open	OFF

#### On Board Diagnosis Logic

Malfunction is detected when battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.

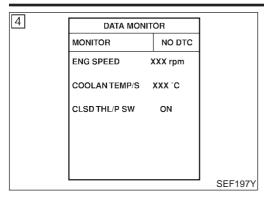
#### **Possible Cause**

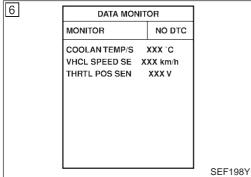
NFEC0812

- Harness or connectors (The closed throttle position switch circuit is shorted.)
- Closed throttle position switch
- Throttle position sensor

#### DTC P0510 CLOSED THROTTLE POSITION SWITCH

DTC Confirmation Procedure





#### **DTC Confirmation Procedure**

**CAUTION:** 

Always drive vehicle at a safe speed.

#### NOTE

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### (P) WITH CONSULT-II

NFEC0813S01

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then start engine.
- 3) Select "CLSD THL/P SW" in "DATA MONITOR" mode. If "CLSD THL/P SW" is not available, go to step 5.
- 4) Check the signal under the following conditions.

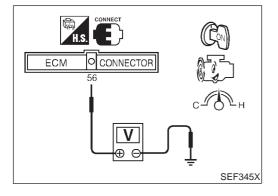
Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

If the result is NG, go to "Diagnostic Procedure", EC-360. If OK, go to following step.

- Select "DATA MONITOR" mode with CONSULT-II.
- 6) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN	More than 2.5V
VHCL SPEED SE	More than 4 km/h (2 MPH)
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

 If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-360.



#### **Overall Function Check**

NFEC081

Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.

#### **WITH GST**

NFEC0814S01

- 1) Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM terminal 56 (Closed throttle position switch signal) and ground under the following conditions.

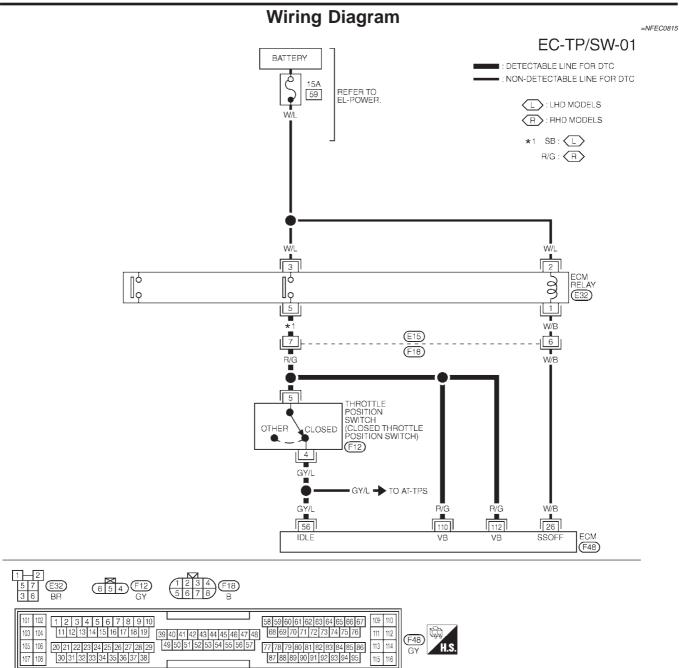
At idle: Battery voltage

#### **DTC P0510 CLOSED THROTTLE POSITION SWITCH**

Overall Function Check (Cont'd)

#### At 2,000 rpm: Approximately 0V

3) If NG, go to "Diagnostic Procedure", EC-360.



MEC005D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5		ENGINE RUNNING WITH ACCELERATOR PEDAL FULLY RELEASED UNDER WARM-UP CONDITION	BATTERY VOLTAGE	
	11/0	(CLOCED DOCITION)	IGN ON WITH ACCELERATOR PEDAL DEPRESSED	APPROX. 0V

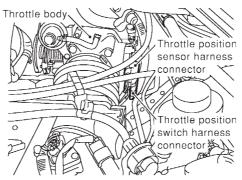
SEF626XC

#### **Diagnostic Procedure**

NFEC0816

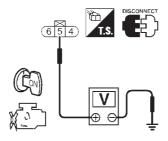
#### 1 CHECK CLOSED THROTTLE POSITION SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect throttle position switch harness connector.



SEF260X

- 3. Turn ignition switch "ON".
- 4. Check voltage between throttle position switch terminal 5 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF346X

OK or NG

OK ►	GO TO 3.
NG ►	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness for open or short between throttle position switch and ECM relay
- Harness for open or short between throttle position switch and ECM

Repair harness or connectors.

#### 3 CHECK CLOSED THROTTLE POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 56 and throttle position switch terminal 4. Refer to Wiring Diagram.

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK •	GO TO 4.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

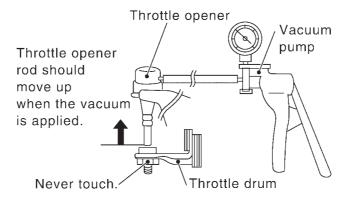
Diagnostic Procedure (Cont'd)

4	CHECK IGNITION TIM	ING AND ENGINE	IDLE SPEED	
Chec	k the following items. Refe	r to "Basic Inspection	n", EC-92.	
		Items	Specifications	
		Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)	
		Idle speed	M/T: $625 \pm 50$ rpm (VQ30DE engine) $675 \pm 50$ rpm (VQ20DE engine) A/T: $700 \pm 50$ rpm (in "P" or "N" position)	
				MTBL0625
Mode	els with CONSULT-II	GO TO 6.		
Mode	els without CON-	GO TO 6.		

### 5 CHECK THROTTLE POSITION SWITCH

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Remove vacuum hose connected to throttle opener.
- 4. Connect suitable vacuum hose to vacuum pump and the throttle opener.
- 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

- 6. Turn ignition switch "ON".
- 7. Select "DATA MONITOR" mode with CONSULT-II.
- 8. Check indication of "CLSD THL/P SW" under the following conditions.

  Measurement must be made with throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

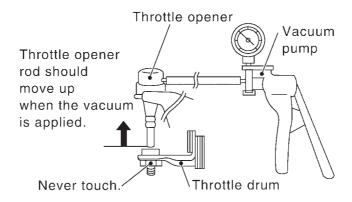
MTBL0355

	OK OF NG		
OK (With CONSULT-II)		GO TO 8.	
OK (Without CONSULT-II)	<b>•</b>	GO TO 9.	
NG	<b>•</b>	GO TO 7.	

Diagnostic Procedure (Cont'd)

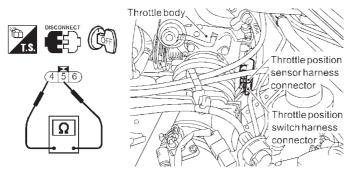
### 6 CHECK THROTTLE POSITION SWITCH

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Remove vacuum hose connected to throttle opener.
- 4. Connect suitable vacuum hose to vacuum pump and the throttle opener.
- 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

- 6. Disconnect closed throttle position switch harness connector.
- 7. Check continuity between closed throttle position switch terminals 4 and 5 under the following conditions. Resistance measurement must be made with throttle position switch installed in vehicle.



Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

SEF347X

OK (With CONSULT-II)	<b></b>	GO TO 8.
OK (Without CONSULT-II)	<b>&gt;</b>	GO TO 9.
NG	<b></b>	GO TO 7.

Diagnostic Procedure (Cont'd)

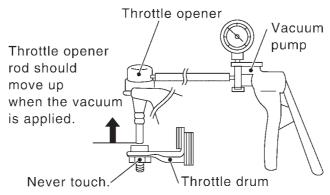
#### **ADJUST THROTTLE POSITION SWITCH** Check the following items. Refer to "Basic Inspection", EC-92. Items Specifications Ignition timing 9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine) Closed throttle position Feeler gauge thickness and switch switch idle position condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF adjustment M/T: $625 \pm 50$ rpm (VQ30DE engine) $675 \pm 50$ rpm (VQ20DE engine) A/T: $700 \pm 50$ rpm (in "P" or "N" position) Target idle speed MTBL0623 Is it possible to adjust closed throttle position switch? Yes or No Yes (With CONSULT-II) GO TO 9. Yes (Without CONSULT-GO TO 9.

### 8 CHECK THROTTLE POSITION SENSOR

### (P) With CONSULT-II

II) No

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine (ignition switch OFF).
- 3. Remove the vacuum hose connected to the throttle opener.
- 4. Connect suitable vacuum hose to the vacuum pump and the opener.
- 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

- 6. Turn ignition switch ON.
- 7. Select "DATA MONITOR" mode with CONSULT-II.
- 8. Check voltage of "THRTL POS SEN" under the following conditins.

Voltage measurement must be made with throttle position sensor installed in vehicle.

Replace throttle position switch.

Throttle valve conditions	THRTL POS SEN
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

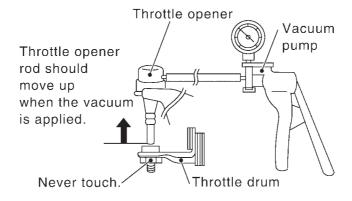
MTBL0230

L	OK or NG		
	OK	<b></b>	GO TO 10.
	NG	<b></b>	Replace throttle position sensor.

Diagnostic Procedure (Cont'd)

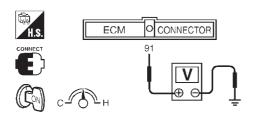
### CHECK THROTTLE POSITION SENSOR

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine (ignition switch OFF).
- 3. Remove the vacuum hose connected to the throttle opener.
- 4. Connect suitable vacuum hose to the vacuum pump and the opener.
- 5. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

- 6. Turn ignition switch ON.
- 7. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground. Voltage measurement must be made with throttle position sensor installed in vehicle.



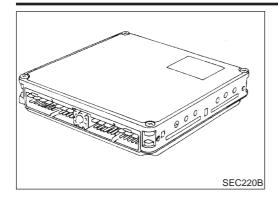
Throttle valve conditions	Voltage
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

SEF348X

OK	or	NG
----	----	----

OK •	GO TO 10.
NG ►	Replace throttle position sensor.

10	CHECK INTERMITTENT INCIDENT		
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	► INSPECTION END		



### **Component Description**

The ECM consists of a microcomputer and connector for signal input and output and for power supply. The unit controls the engine.

### On Board Diagnosis Logic

NFEC0272

Malfunction is detected when ECM calculation function is malfunctioning.

### **Possible Cause**

ECM

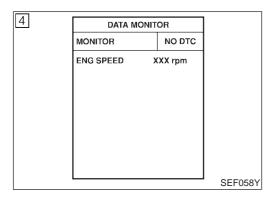
NFEC0518

### **DTC Confirmation Procedure**

NOTE:

NFEC0273

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.



### (P) WITH CONSULT-II

NFEC0273S01

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine.
- 4) Run engine for at least 30 seconds at idle speed.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-366.

### **WITH GST**

NFEC0273S03

Follow the procedure "WITH CONSULT-II" above.

### NO TOOLS

NFEC0273S02

- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 30 seconds.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with FCM
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-366.

### **Diagnostic Procedure**

NFEC0274

#### INSPECTION START

### (P) With CONSULT-II

- 1. Turn ignition switch "ON".
- 2. Select "SELF DIAG RESULTS" mode with CONSULT-II.
- 3. Touch "ERASE".
- 4. Perform "DTC Confirmation Procedure".

See EC-365.

5. Is the 1st trip DTC P0605 displayed again?

#### (a) With GST

- 1. Turn ignition switch "ON".
- 2. Select MODE 4 with GST.
- 3. Touch "ERASE".
- 4. Perform "DTC Confirmation Procedure".

See EC-365.

5. Is the 1st trip DTC P0605 displayed again?

### No Tools

- 1. Turn ignition switch "ON".
- 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Refer to "How to Erase Emission-related Diagnostic Information", EC-57, EC-60.
- 3. Perform "DTC Confirmation Procedure".

See EC-365.

4. Is the 1st trip DTC 0605 displayed again?

### Yes or No

Yes [With NVIS (NATS) system]	<b>•</b>	GO TO 2.
Yes [Without NVIS (NATS) system]	<b>•</b>	GO TO 3.
No	<b></b>	INSPECTION END

### 2 REPLACE ECM

- 1. Turn ignition switch "OFF".
- 2. Replace ECM.
- 3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to "NVIS (Nissan Vehicle Immobilizer System NATS)", EC-61.
- 4. Perform "Idle Air Volume Learning", EC-41.

Which is the result CMPLT or INCMP?

#### **CMPLT or INCMP**

CMPLT	<b>•</b>	INSPECTION END
INCMP	•	Follow the construction of "Idle Air Volume Learning".

3	REPLACE ECM				
2. Rep 3. Per	<ol> <li>Turn ignition switch "OFF".</li> <li>Replace ECM.</li> <li>Perform "Idle Air Volume Learning", EC-41.         Which is the result CMPLT or INCMP?     </li> </ol>				
	CMPLT or INCMP				
CMPL	CMPLT INSPECTION END				
INCMF	INCMP Follow the construction of "Idle Air Volume Learning".				

Description

# **Description SYSTEM DESCRIPTION**

NFEC0823

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position		
Ignition switch	Start signal		Swirl control valve control
Crankshaft position sensor (POS)	Engine speed (POS signal)	Swirl control	solenoid valve  ↓ Vacuum signal
Crankshaft position sensor (REF)	Engine speed (REF signal)	valve control	Swirl control valve actuator
Mass air flow sensor	Amount of intake air		Swirl control valve
Engine coolant temperature sensor	Engine coolant temperature		

This system has a swirl control valve in the intake passage of each cylinder.

While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

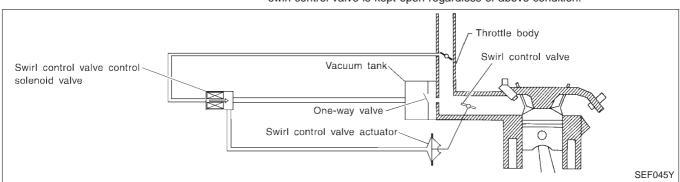
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

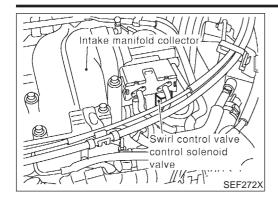
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
ON	Below 3,200 rpm	ON	Closed
OFF	Less than 3,200 rpm	ON	Closed
OFF	More than 3,600 rpm	OFF	Open

When engine coolant temperature is below 10°C (50°F) and above 55°C (131°F), swirl control valve is kept open regardless of above condition.



Description (Cont'd)



### **COMPONENT DESCRIPTION**

#### Swirl Control Valve Control Solenoid Valve

NFEC0823S02

NFEC0823S0201

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

# CONSULT-II Reference Value in Data Monitor Mode

NFEC0824

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 55°C (131°F).	OFF

### On Board Diagnosis Logic

NEEC082

Malfunction is detected when an improper voltage signal is sent to ECM through swirl control valve control solenoid valve.

### **Possible Cause**

NFEC0826

- Harness or connectors (The swirl control valve control solenoid valve circuit is open or shorted.)
- Swirl control valve control solenoid valve

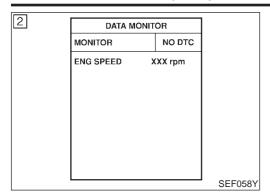
### **DTC Confirmation Procedure**

NFEC0827

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

DTC Confirmation Procedure (Cont'd)



### (P) WITH CONSULT-II

NFEC0827S04

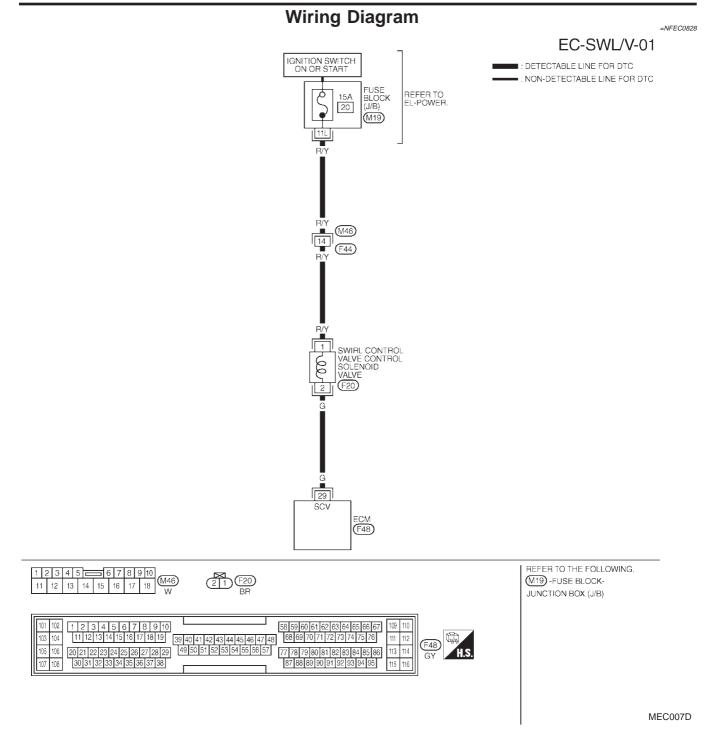
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- Wait at least 5 seconds.
   If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-372.

### **WITH GST**

NFEC0827S05

Follow the procedure "With CONSULT-II" above.

Wiring Diagram



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
29	6		ENGINE RUNNING AT IDLE SPEED WITH ENGINE COOLANT TEMPERATURE BETWEEN 15°C (59°F) AND 50°C (122°F).	0 - 1V
29	G		ENGINE DUNNING AT IDLE SPEED WITH	BATTERY VOLTAGE

SEF627XB

Diagnostic Procedure

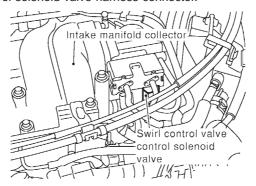
### 

		•				
2	CHECK SWIRL CONTI	ROL VALVE CO	NTROL SOLEN	OID VA	LVE CIRCUIT	
1. Tu 2. Se	th CONSULT-II rn ignition switch "ON". lect "SWIRL CONT SOL/Vuch "ON" and "OFF" on Co			ONSULT	Г-II.	
			ACTIVE TES	Т	]	
			SWIRL CONT SOL/V	OFF		
			MONITOR	,		
			ENG SPEED	XXX rpm		
			IACV-AAC/V	XXX step		
						SEF069Y
4. Ma	ke sure that clicking soun	d is heard from th	ne swirl control va	alve con	trol solenoid valve.	021 000 1
			OK or NO	3		
OK	<b>•</b>	GO TO 6.				
NG	•	GO TO 3.				

Diagnostic Procedure (Cont'd)

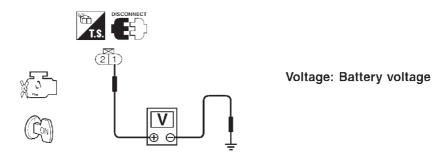
### 3 CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect swirl control valve control solenoid valve harness connector.



SEF272X

- 3. Turn ignition switch "ON".
- 4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



SEF619X

OK or NG

	DK	GO TO 5.
١	IG ►	GO TO 4.

#### 4 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- 15A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse
  - Repair harness or connectors.

## 5 CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 29 and swirl control valve control solenoid valve terminal 2. Refer to Wiring Diagram.

### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK	or	NG
----	----	----

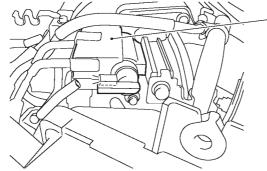
OK •	GO TO 6.
NG ►	Repair open circuit, short to ground or short to power in harness connectors.

Diagnostic Procedure (Cont'd)

### CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

### (P) With CONSULT-II

- 1. Reconnect the disconnected harness connectors.
- 2. Start engine and let it idle.
- 3. Remove vacuum hose connected to swirl control valve actuator.
- 4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Touch "ON" and "OFF" on CONSULT-II screen.
- 6. Check vacuum existence and operation delay time under the following conditions.



Swirl control valve control solenoid valve

SWIRL CONT SOL/V	Vacuum
ON	should exist.
OFF	should not exist.

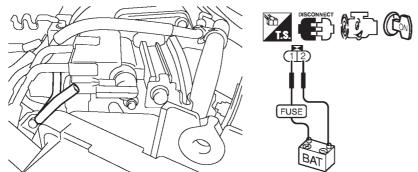
Operation takes less than 1 second.



SEF046Y

### Without CONSULT-II

- 1. Reconnect ECM harness connector.
- 2. Remove vacuum hose connected to swirl control valve actuator.
- 3. Start engine and let it idle.
- 4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
- 5. Check vacuum existence and operation delay time under the following conditions.



Condition	Vacuum	
12V direct current supply	Should exist.	
No supply	Should not exist.	

Operation takes less than 1 second.

SEF047Y

OK •	GO TO 7.
NG ►	Replace intake manifold collector assembly.

OK or NG

# 7 CHECK INTERMITTENT INCIDENT Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131. INSPECTION END

System Description

### **System Description**

#### **COOLING FAN CONTROL**

NFFC0554 NFEC0554S01

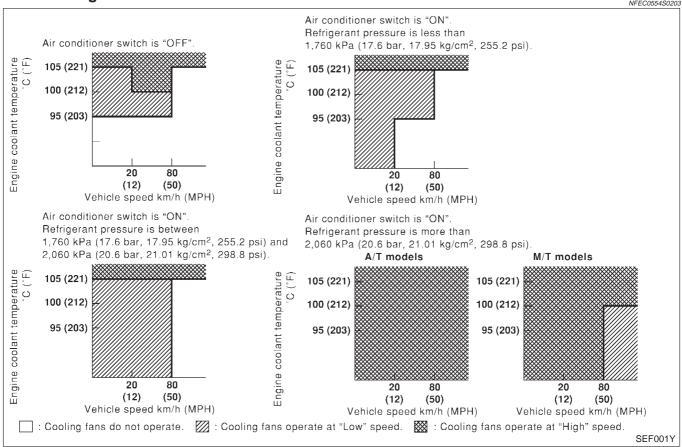
Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner "ON" signal	Cooling fan control	Cooling fan relay(s)
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

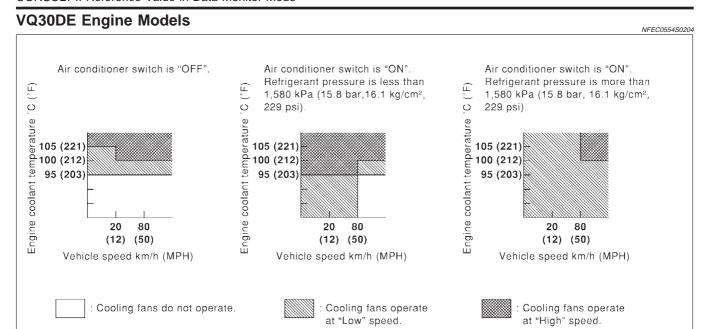
### **OPERATION VQ20DE Engine Models**

NFEC0554S02

NFEC0554S0203



CONSULT-II Reference Value in Data Monitor Mode



# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

NFEC0555

SEF578XB

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	Engine: After warming up, idle	Air conditioner switch: OFF	OFF
	the engine	Air conditioner switch: ON (Compressor operates)	ON
COOLING FAN		Engine coolant temperature is 94°C (201°F) or less	OFF
	<ul><li>After warming up engine, idle the engine.</li><li>Air conditioner switch: OFF</li></ul>	Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

### On Board Diagnosis Logic

NFEC055

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Malfunction is detected when cooling fan does not operate properly (Overheat), cooling fan system does not operate properly (Overheat) and engine coolant was not added to the system using the proper filling method.

### **Possible Cause**

NFEC0563

- Harness or connectors (The cooling fan circuit is open or shorted.)
- Cooling fan
- Radiator hose
- Radiator
- Radiator cap
- Water pump
- Thermostat

For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-390.

#### **CAUTION:**

When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA-16, "Changing Engine Coolant". Also, replace the engine oil.

- 1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Engine Coolant Mixture Ratio".
- 2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

### **Overall Function Check**

NFEC0558

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

#### WARNING

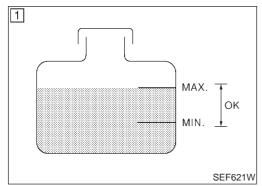
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

#### WITH CONSULT-II

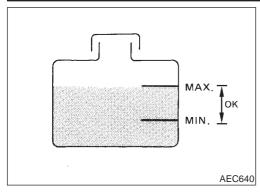
NFEC0558S01

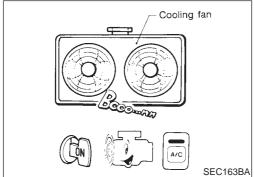
- Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-381.
- 2) Confirm whether the customer filled the coolant or not. If the customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-381.
- 3) Turn ignition switch "ON".
- Perform "COOLING FAN" in "ACTIVE TEST" mode with CON-SULT-II.
- 5) If the results are NG, go to "Diagnostic Procedure", EC-381.

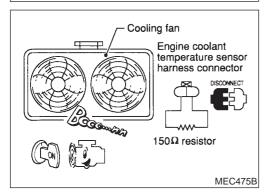


4	ACTIVE TES	T	
	COOLING FAN	OFF	
	MONITOR		
	COOLAN TEMP/S	XXX ,C	

Overall Function Check (Cont'd)







### M WITHOUT CONSULT-II

NFEC0558S03

- Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "Diagnostic Procedure", EC-381.
- 2) Confirm whether the customer filled the coolant or not. If the customer filled the coolant, skip the following steps and go to "Diagnostic Procedure", EC-381.
- 3) Start engine.

### Be careful not to overheat engine.

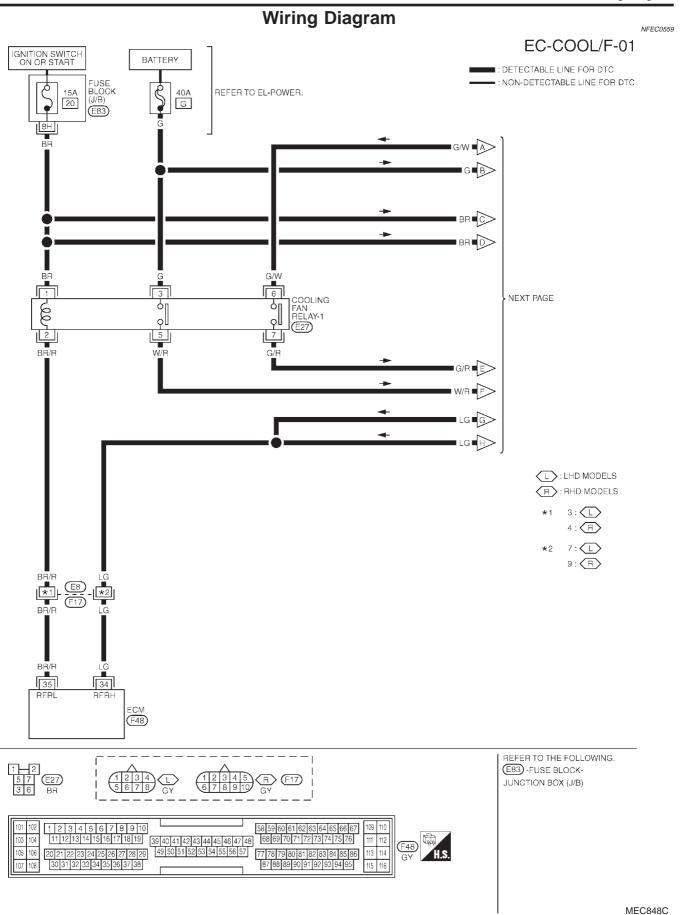
- 4) Set temperature control lever to full cold position.
- Turn air conditioner switch "ON".
- 6) Turn blower fan switch "ON".
- r) Run engine at idle for a few minutes with the air conditioner operating.

### Be careful not to overheat engine.

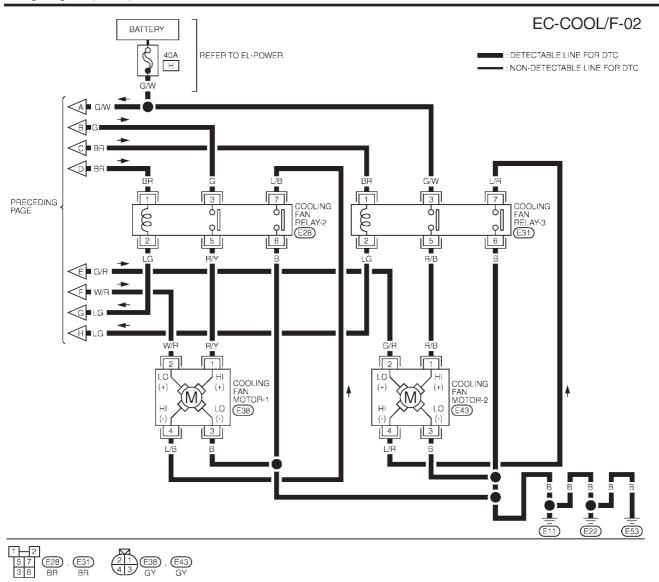
- 8) Make sure the cooling fans are operating at low speeds.
- 9) Turn ignition switch "OFF".
- 10) Turn air conditioner switch and blower fan switch "OFF".
- Disconnect engine coolant temperature sensor harness connector.
- 12) Connect  $150\Omega$  resistor to engine coolant temperature sensor harness connector.
- 13) Restart engine and make sure the cooling fans are operating at high speed.

### Be careful not to overheat engine.

14) If NG, go to "Diagnostic Procedure", EC-381.



Wiring Diagram (Cont'd)



MEC849C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
34	LG	COOLING FAN RELAY (HIGH)	ENGINE RUNNING WITH COOLING FAN NOT OPERATING	BATTERY VOLTAGE
34	LG		ENGINE RUNNING WITH COOLING FAN OPERATING AT HIGH SPEED	0 - 1.0V
25	35 BR/R		ICOOLING FAN NOT OPERATING	BATTERY VOLTAGE
35			ENGINE RUNNING WITH COOLING FAN OPERATING AT LOW SPEED	0 - 1.0V

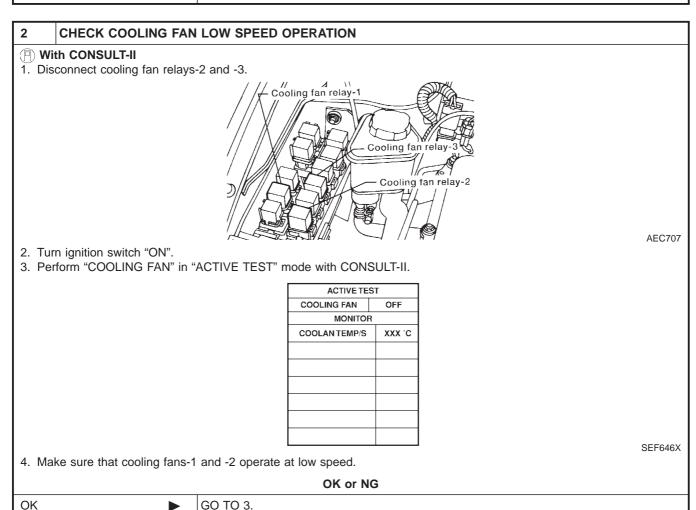
SEF630XB

Diagnostic Procedure

### **Diagnostic Procedure**

NFEC0560

1	INSPECTION START		
Do yo	Do you have CONSULT-II?		
	Yes or No		
Yes	<b>&gt;</b>	GO TO 2.	
No	<b>•</b>	GO TO 4.	



Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-386.)

NG

Diagnostic Procedure (Cont'd)

### **CHECK COOLING FAN HIGH SPEED OPERATION**

### (P) With CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Reconnect cooling fan relays-2 and -3.
- 3. Turn ignition switch "ON".
- 4. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.

ACTIVE TES	T
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX ,C

SEF111X

5. Make sure that cooling fans-1 and -2 operate at high speed.

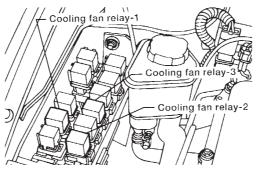
#### OK or NG

OK	GO TO 6.
NG	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-388.)

### **CHECK COOLING FAN LOW SPEED OPERATION**

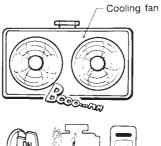
### Without CONSULT-II

1. Disconnect cooling fan relays-2 and -3.



AEC707

- 2. Start engine and let it idle.
- 3. Set temperature lever at full cold position.
- 4. Turn air conditioner switch "ON".
- 5. Turn blower fan switch "ON".
- 6. Make sure that cooling fans-1 and -2 operate at low speed.





SEC163BA

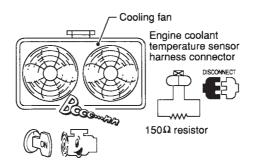
OK ▶	GO TO 5.
NG ▶	Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-386.)

Diagnostic Procedure (Cont'd)

### CHECK COOLING FAN HIGH SPEED OPERATION

### **⋈** Without CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Reconnect cooling fan relays-2 and -3.
- 3. Turn air conditioner switch and blower fan switch "OFF".
- 4. Disconnect engine coolant temperature sensor harness connector.
- 5. Connect  $150\Omega$  resistor to engine coolant temperature sensor harness connector.
- 6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.



MEC475B

#### OK or NG

OK •	GO TO 6.
NG ►	Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-388.)

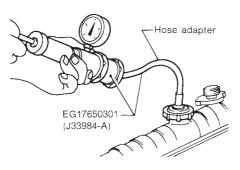
### 6 CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup>, 23 psi)

### **CAUTION:**

Higher than the specified pressure may cause radiator damage.



SLC754A

### Pressure should not drop.

### OK or NG

OK •	GO TO 8.
NG •	GO TO 7.

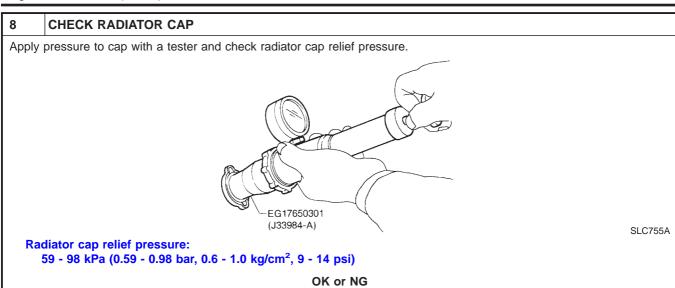
### 7 DETECT MALFUNCTIONING PART

Check the following for leak.

- Hose
- Radiator
- Water pump (Refer to LC-12, "Water Pump".)

Repair or replace.

Diagnostic Procedure (Cont'd)



### 9 CHECK THERMOSTAT

1. Remove thermostat.

OK

NG

2. Check valve seating condition at normal room temperatures. **It should seat tightly.** 

GO TO 9.

Replace radiator cap.

3. Check valve opening temperature and valve lift.



SLC343

Valve opening temperature: 82°C (180°F) [standard] Valve lift:

More than 8.6 mm/95°C (0.339 in/203°F)

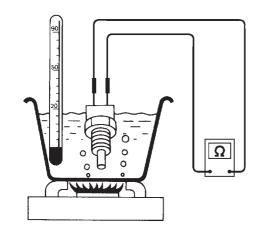
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC-16, "Thermostat".

OK ►	GO TO 10.
NG ►	Replace thermostat.

Diagnostic Procedure (Cont'd)

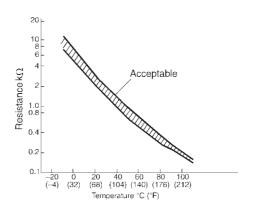
### 10 CHECK ENGINE COOLANT TEMPERATURE SENSOR

- 1. Remove engine coolant temperature sensor.
- 2. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



#### <Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



SEF304X

ı	OK •	GO TO 11.
ı	NG •	Replace engine coolant temperature sensor.

11	CHECK MAIN 12 CAUS	SES .	
If the	If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-390.		
	► INSPECTION END		

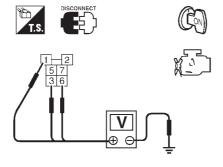
Diagnostic Procedure (Cont'd)

### PROCEDURE A

NEECO560SO

### 1 CHECK COOLING FAN POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect cooling fan relay-1.
- 3. Turn ignition switch "ON".
- 4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF590X

OI	< ο	r i	٧G
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OK	<b></b>	GO TO 3.
NG	<b></b>	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

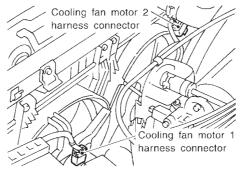
Check the following.

- 15A fuse
- 40A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

Repair open circuit or short to ground or short to power in harness or connectors.

### 3 CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.



SEF304V

3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 2, cooling fan motor-1 terminal 3 and body ground. Refer to Wiring Diagram.

#### Continuity should exist.

- 4. Also check harness for short to ground and short to power.
- 5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 2, cooling fan motor-2 terminal 3 and body ground. Refer to Wiring Diagram.

### Continuity should exist.

6. Also check harness for short to ground and short to power.

OK •	GO TO 4.
NG	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

### 4 CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 35 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

#### OK or NG

OK	<b>&gt;</b>	GO TO 6.
NG	<b>•</b>	GO TO 5.

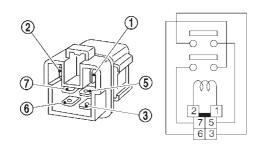
### 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F17
- Harness for open or short between cooling fan relay-1 and ECM
  - Repair open circuit or short to ground or short to power in harness or connectors.

### 6 CHECK COOLING FAN RELAY-1

Check continuity between cooling fan relay-1 terminals 3 and 5, 6 and 7 under the following conditions.



Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

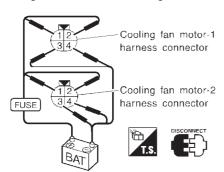
SEF591X

### OK or NG

OK ►	GO TO 7.
NG ►	Replace cooling fan relay.

### 7 CHECK COOLING FAN MOTORS-1 AND -2

Supply battery voltage between the following terminals and check operation.



	Speed	Terminals		
		(+)	(-)	
Cooling fan motor-1	Low	2	3	
	High	1,2	3,4	
Cooling fan motor-2	Low	2	3	
	High	1,2	3,4	

SEF592X

OK •	GO TO 8.
NG ►	Replace cooling fan motors.

Diagnostic Procedure (Cont'd)

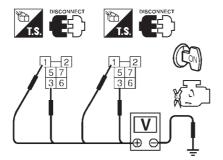
8	CHECK INTERMITTENT INCIDENT	
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	<b>•</b>	INSPECTION END

### PROCEDURE B

NFEC0560S02

### CHECK COOLING FAN POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect cooling fan relays-2 and -3.
- 3. Turn ignition switch "ON".
- 4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF593X

OK or NG

OK ▶	GO TO 3.
NG ►	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible link
  - Repair harness or connectors.

#### 3 CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
- 3. Check harness continuity between cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 1, cooling fan relay-2 terminal 7 and cooling fan motor-1 terminal 4, cooling fan relay-2 terminal 6 and body ground. Refer to Wiring Diagram.

  Continuity should exist.
- 4. Also check harness for short to ground and short to power.
- 5. Check harness continuity between cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1, cooling fan relay-3 terminal 7 and cooling fan motor-2 terminal 4, cooling fan relay-3 terminal 6 and body ground. Refer to Wiring Diagram.

  Continuity should exist.
- 6. Also check harness for short to ground and short to power.

OK	or	NG
----	----	----

OK	<b>&gt;</b>	<b>▶</b> GO TO 4.	
NG Repair open circuit or s		Repair open circuit or short to ground or short to power in harness or connectors.	

Diagnostic Procedure (Cont'd)

### 4 CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 34 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2. Refer to Wiring Diagram.

#### Continuity should exist.

3. Also check harness for short to ground and short to power.

#### OK or NG

OK •	GO TO 6.
NG •	GO TO 5.

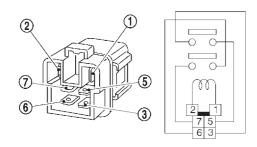
### 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, E17
- Harness for open or short between cooling fan relays-2 and -3 and ECM
  - Repair open circuit or short to ground or short to power in harness or connectors.

### 6 CHECK COOLING FAN RELAYS-2 AND -3

Check continuity between cooling fan relay-2, -3 terminals 3 and 5, 6 and 7 under the following conditions.



Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

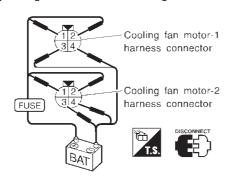
SEF591X

#### OK or NG

OK ▶	GO TO 7.
NG ►	Replace cooling fan relays.

### 7 CHECK COOLING FAN MOTORS

Supply battery voltage between the following terminals and check operation.



	Speed -	Terminals	
		(+)	(-)
Cooling fan motor-1	Low	2	3
motor-1	High	1,2	3,4
Cooling fan motor-2	Low	2	3
motor-Ž	High	1,2	3,4

SEF592X

OK ►	GO TO 8.
NG ▶	Replace cooling fan motors.

Diagnostic Procedure (Cont'd)

8	CHECK INTERMITTENT INCIDENT				
1. Per	1. Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.				
	► INSPECTION END				

### **Main 12 Causes of Overheating**

NFEC0561

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	<ul> <li>Blocked radiator</li> <li>Blocked condenser</li> <li>Blocked radiator grille</li> <li>Blocked bumper</li> </ul>	Visual	No blocking	_
	2	Coolant mixture	Coolant tester	50 - 50% coolant mixture	See MA-13, "RECOM- MENDED FLUIDS AND LUBRICANTS".
	3	Coolant level	Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-16, "Changing Engine Coolant".
	4	Radiator cap	Pressure tester	59 - 98 kPa (0.59 - 1.0 bar, 0.6 - 1.0 kg/cm <sup>2</sup> , 9 - 14 psi) (Limit)	See LC-11, "System Check".
ON*2	5	Coolant leaks	Visual	No leaks	See LC-11, "System Check".
ON*2	6	Thermostat	Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-16, "Thermostat" and LC-18, "Radiator".
ON*1	7	Cooling fan	CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-375).
OFF	8	Combustion gas leak	Color checker chemical tester 4 Gas analyzer	Negative	_
ON*3	9	Coolant temperature gauge	Visual	Gauge less than 3/4 when driving	_
		Coolant overflow to reservoir tank	Visual	No overflow during driving and idling	See MA-16, "Changing Engine Coolant".
OFF*4	10	Coolant return from reservoir tank to radia- tor	Visual	Should be initial level in reservoir tank	See MA-15, "ENGINE MAINTENANCE".
OFF	11	Cylinder head	Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-40, "Inspection".
	12	Cylinder block and pistons	Visual	No scuffing on cylinder walls or piston	See EM-60, "Inspection".

<sup>\*1:</sup> Turn the ignition switch ON.

For more information, refer to LC-23, "OVERHEATING CAUSE ANALYSIS".

<sup>\*2:</sup> Engine running at 3,000 rpm for 10 minutes.

<sup>\*3:</sup> Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

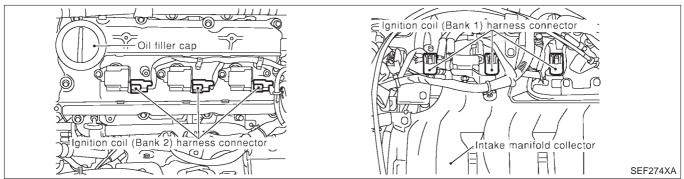
<sup>\*4:</sup> After 60 minutes of cool down time.

### **Component Description**

### **IGNITION COIL & POWER TRANSISTOR**

NFEC0830S01

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.



### On Board Diagnosis Logic

NFEC0831

Malfunction is detected when the ignition signal in the primary circuit is not sent to ECM during engine cranking or running.

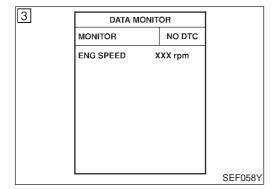
### **Possible Cause**

NFEC0832

- Harness or connectors (The ignition primary circuit is open or shorted.)
- Power transistor unit built into ignition coil
- Condenser

NOTE:

- Crankshaft position sensor (REF)
- Crankshaft position sensor (REF) circuit



### **DTC Confirmation Procedure**

NFEC0833

- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
- If DTC P1320 is displayed with DTC P0340, P1335 or P1336, perform trouble diagnosis for DTC P0340, P1335 or P1336 first. Refer to EC-310, EC-402 or EC-409.

### (P) WITH CONSULT-II

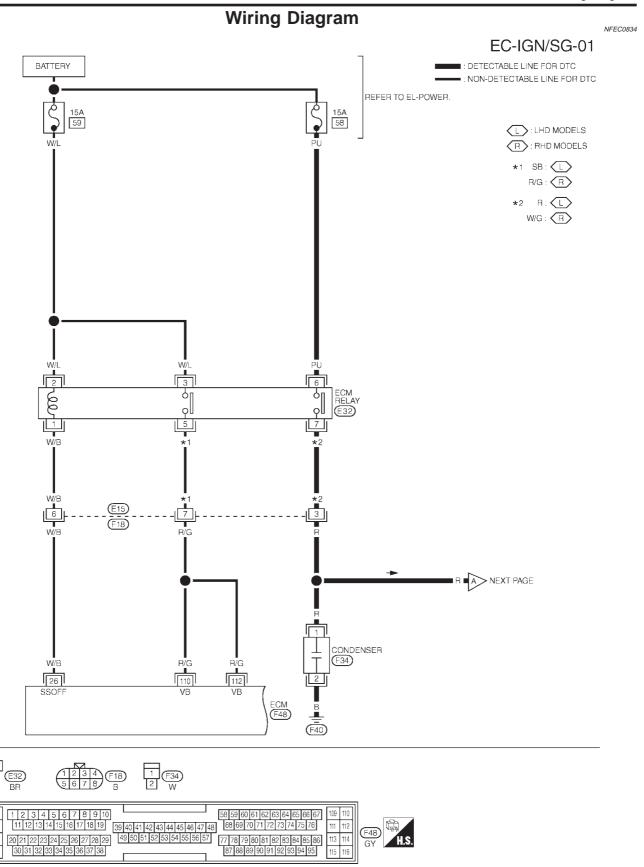
NFEC0833S01

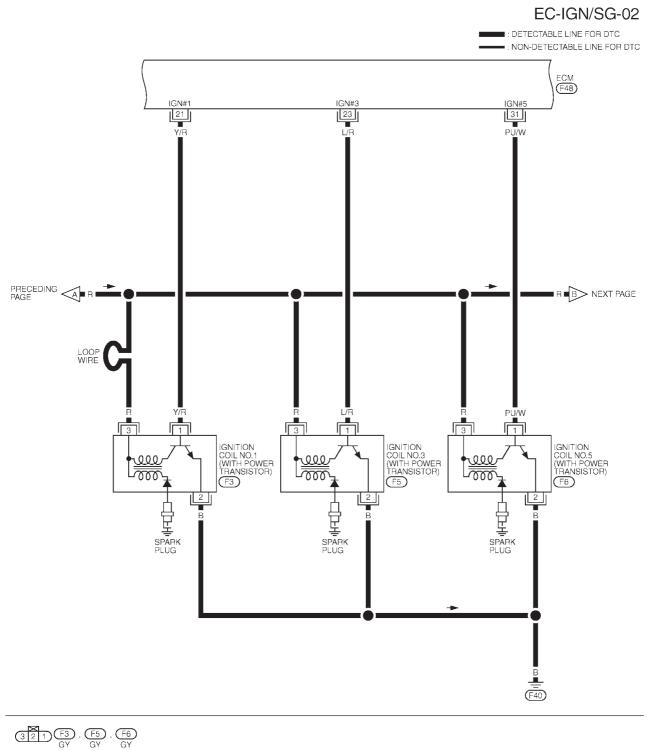
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.

- Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-396.

### **® WITHOUT CONSULT-II**

- 1) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-396.

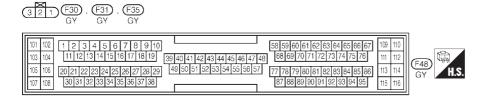






MEC752C

# EC-IGN/SG-03 : DETECTABLE LINE FOR DTC -: NON-DETECTABLE LINE FOR DTC ECM (F48) IGN#6 32 GY/R IGN#2 22 G/R PRECEDING BRR IGNITION COIL NO.4 (WITH POWER TRANSISTOR) IGNITION COIL NO.2 (WITH POWER TRANSISTOR) IGNITION COIL NO.6 (WITH POWER TRANSISTOR) عع<u>ب</u> reee ىلل Ĭ<sub>®</sub> مس (F31) (F30) 青 SPARK PLUG SPÄRK PLUG



MEC753C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

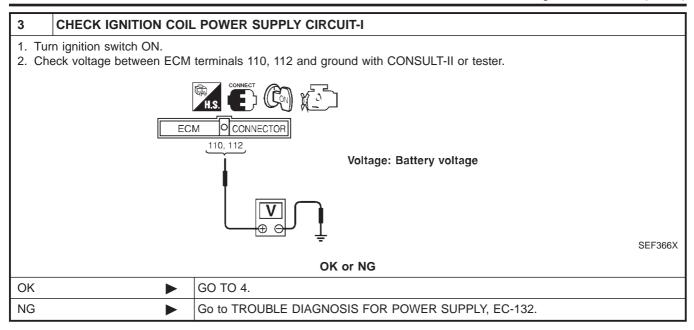
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN THE ECM TERMINALS, SUCH AS THE GROUND.

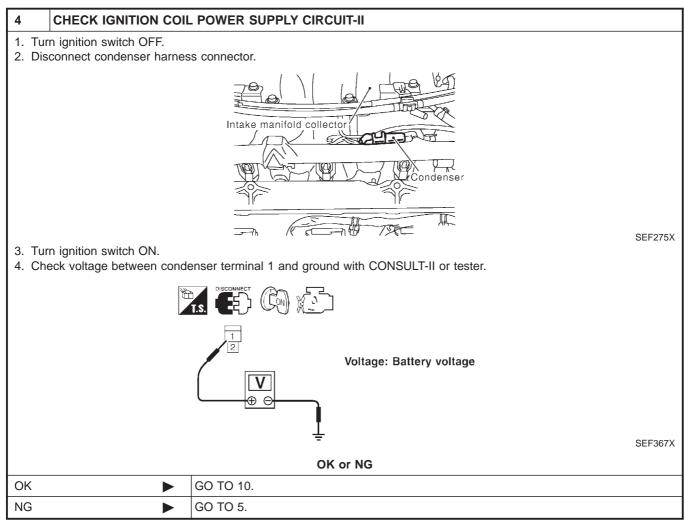
	<b>NIRE COLOR</b>	ITEM	CONDITION	DATA (DC)
21 22 23	Y/R G/R L/R	IGNITION SIGNAL NO. 1 IGNITION SIGNAL NO. 2 IGNITION SIGNAL NO. 3	ENGINE RUNNING AT IDLE SPEED UNDER THE WARM UP CONDITION	0 - 0.2V ★  (V)  4 2 0 100 ms
30 31 32	GY PU/W GY/R	IGNITION SIGNAL NO. 4 IGNITION SIGNAL NO. 5 IGNITION SIGNAL NO. 6	ENGINE RUNNING AT 2,500 RPM	0 - 0.2V *  (V) 4 2 0 100 ms

### **Diagnostic Procedure**

NFEC0835 **CHECK ENGINE START** Turn ignition switch "OFF", and restart engine. Is engine running? Yes or No Yes (With CONSULT-II) GO TO 2. Yes (Without CONSULT-GO TO 12. II) No GO TO 3.

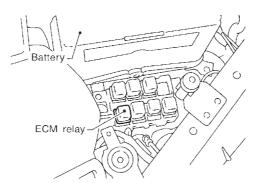
2	SEARCH FOR MALFUN	INCTIONING CIRCUIT				
1. Per	With CONSULT-II  1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.  2. Search for circuit which does not produce a momentary engine speed drop.					
			ACTIVE TES	T		
			POWER BALANCE			
			MONITOR	_		
			ENG SPEED	XXX rpm		
			MAS A/F SE-B1	xxx v		
			IACV-AAC/V	XXX step		
	SEF190Y					
	<b>&gt;</b>	GO TO 12.				





#### 5 CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM relay.



SEF589PB

- 3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1. Refer to Wiring Diagram.

  Continuity should exist.
- 4. Also check harness for short to ground and short to power.

#### OK or NG

OK		GO TO 7.
NG	•	GO TO 6.

#### 6 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F18, E15
- Harness for open or short between ECM relay and condenser
  - Repair open circuit or short to ground or short to power in harness or connectors.

# 

#### 8 DETECT MALFUNCTIONING PART

Check the following.

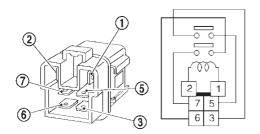
- 15A fuse
- Harness for open and short between ECM relay and fuse

Repair or replace harness or connectors.

#### **DTC P1320 IGNITION SIGNAL**

#### 9 CHECK ECM RELAY

- 1. Apply 12V direct current between ECM relay terminals 1 and 2.
- 2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.



Condition	Continuity	
12V direct current supply between terminals 1 and 2	Yes	
OFF	No	

SEF296X

#### OK or NG

OK •	GO TO 17.
NG ►	Replace ECM relay.

#### 10 CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check harness continuity between condenser terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

#### OK or NO

OK	GO TO 11.
NG	Repair open circuit or short to ground or short to power in harness or connectors.

#### 11 CHECK CONDENSER

Check resistance between condenser terminals 1 and 2.



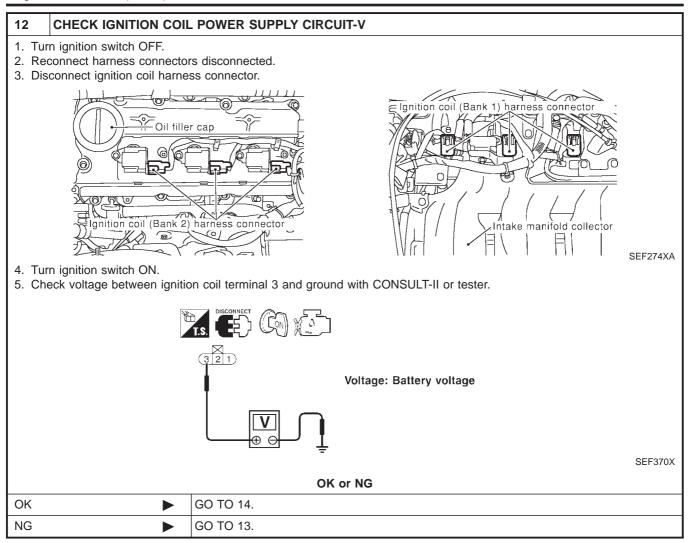


Resistance: Above 1M  $\Omega$  at 25°C (77°F)

SEF369X

OK	or	NG
----	----	----

OK ►	GO TO 12.
NG ▶	Replace condenser.



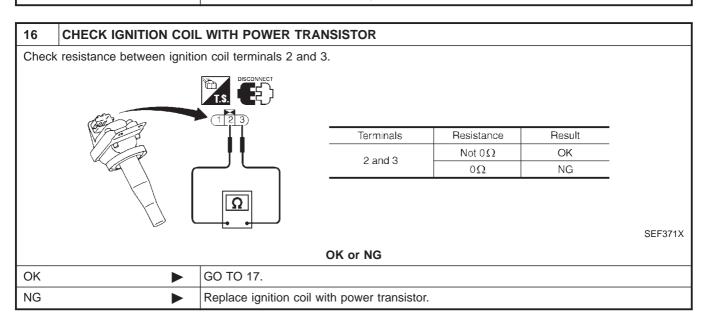
13	3 DETECT MALFUNCTIONING PART		
Check	Check the harness for open or short between ignition coil and harness connector F18.		
	► Repair or replace harness or connectors.		

14	14 CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT		
2. Ch	<ol> <li>Turn ignition switch OFF.</li> <li>Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.         Continuity should exist.     </li> <li>Also check harness for short to ground and short to power.</li> </ol>		
	OK or NG		
ОК	OK ▶ GO TO 15.		
NG	NG Repair open circuit or short to ground or short to power in harness or connectors.		

# CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Disconnect ECM harness connector. Check harness continuity between ECM terminals 21, 22, 23, 30, 31, 32 and ignition coil terminal 1. Refer to Wiring Diagram. Continuity should exist. Also check harness for short to ground and short to power. OK or NG

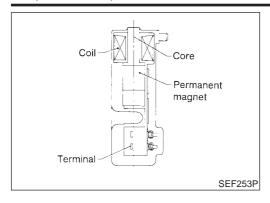
Repair open circuit or short to ground or short to power in harness or connectors.

NG



17	17 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

Component Description



#### **Component Description**

The crankshaft position sensor (REF) is located on the oil pan (upper) facing the crankshaft pulley. It detects the TDC (Top Dead Center) signal (120° signal).

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the crankshaft pulley will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the TDC signal (120° signal).

# **CONSULT-II** Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0574

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-RPM (POS)	Tachometer: Connect     Run engine and compare tachometer indication with the CONSULT-II	Almost the same speed as the
ENG SPEED	value.	CONSULT-II value.

#### On Board Diagnosis Logic

NFEC0576

Malfunction is detected when

(Malfunction A) 120° signal is not entered to ECM for the first few seconds during engine cranking,

(Malfunction B) 120° signal is not entered to ECM during engine running,

(Malfunction C) 120° signal cycle excessively changes during engine running.

#### **FAIL-SAFE MODE**

NFEC0576S01

When the ECM enters the fail-safe mode, the MI illuminates.

Detected items	Engine operating condition in fail-safe mode
	Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.

#### **Possible Cause**

NFEC0577

- Harness or connectors (The crankshaft position sensor (REF) circuit is open or shorted.)
- Crankshaft position sensor (REF)
- Starter motor (Refer to SC section.)
- Starting system circuit (Refer to SC section.)
- Dead (Weak) battery

#### **DTC Confirmation Procedure**

NFEC0578

#### NOTE:

- Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND C".
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

#### PROCEDURE FOR MALFUNCTION A

NFEC0578S01

#### With CONSULT-II

NFEC0578S0101

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Crank engine for at least 2 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-406.

#### With GST

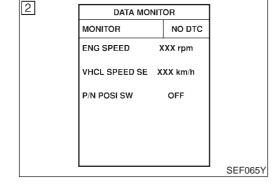
NFEC0578S0103

Follow the procedure "With CONSULT-II" above.

#### No Tools

NFEC0578S0102

- 1) Crank engine for at least 2 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-406.



DATA MONITOR

NO DTC

SEF058Y

XXX rpm

MONITOR

**ENG SPEED** 

3

# PROCEDURE FOR MALFUNCTION B AND C R With CONSULT-II

NFEC0578S02

NFEC0578S0201

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-406.

#### **With GST**

NFEC0578S0203

Follow the procedure "With CONSULT-II" above.

DTC Confirmation Procedure (Cont'd)

#### No Tools

- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-406.

## **Wiring Diagram** =NFEC0579 EC-REF-01 CRANKSHAFT POSITION SENSOR (REF) : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC (F196) JOINT CONNECTOR-18 F46 ECM F48 (F39) (F41) 1111111222222 L 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 (F48) 20 21 22 23 24 25 26 27 28 29 77 78 79 80 81 82 83 84 85 86 30 31 32 33 34 35 36 37 38 87 88 89 90 91 92 93 94 95

MEC047D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
65 75	1		ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 2.3V★ (AC VOLTAGE) (V) 20 10 0 10 ms

★: AVERAGE VOLTAGE FOR PULSE SIGNAL (ACTUAL PULSE SIGNAL CAN BE CONFIRMED BY OSCILLOSCOPE.)

SEF861Y

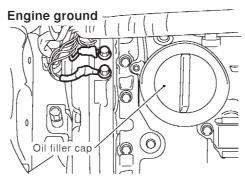
Diagnostic Procedure

#### **Diagnostic Procedure**

=NFEC0580

#### 1 RETIGHTEN GROUND SCREWS

- 1. Turn ignition switch "OFF".
- 2. Loosen and retighten engine ground screws.

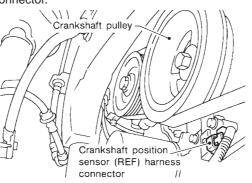


SEF255X

**▶** GO TO 2.

#### 2 CHECK CKPS (REF) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (REF) harness connector.



SEF591PA

- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminals 65, 75 and CKPS (REF) terminal 2. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

#### OK or NG

OK		GO TO 4.
NG	<b>•</b>	GO TO 3.

#### 3 DETECT MALFUNCTIONING PART

Check the following.

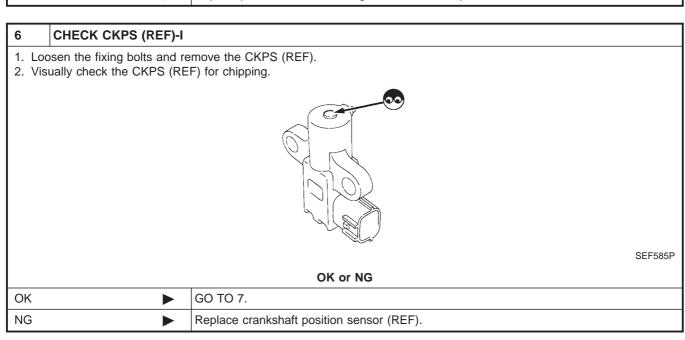
- Harness connectors F43, F191
- Harness for open or short between crankshaft position sensor (REF) and ECM

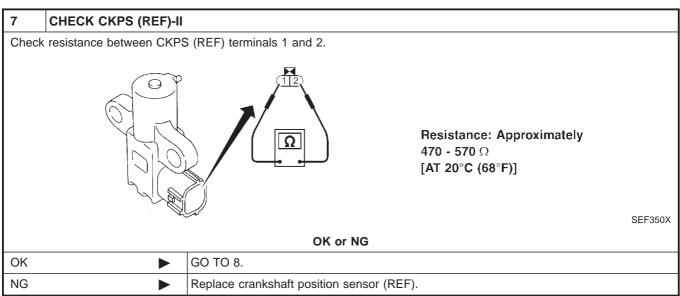
Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

4	CHECK CKPS (REF) G	ROUND CIRCUIT FOR OPEN AND SHORT		
2. Ch	Turn ignition switch "OFF".     Check harness continuity between CKPS (REF) terminal 1 and engine ground.     Continuity should exist.     Also check harness for short to ground and short to power.			
	OK or NG			
OK	<b>&gt;</b>	GO TO 6.		
NG	<b>•</b>	GO TO 5.		

# DETECT MALFUNCTIONING PART Check the following. Harness connectors F43, F191 Harness for open or short between crankshaft position sensor (REF) and engine ground Repair open circuit or short to ground or short to power in harness or connector.





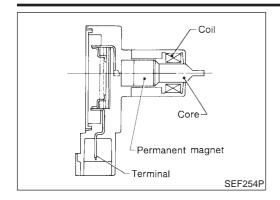
Diagnostic Procedure (Cont'd)

8	CHECK CKPS (REF) S	HIELD CIRCUIT FOR OPEN AND SHORT			
2. Dis 3. Ch	<ol> <li>Turn ignition switch "OFF".</li> <li>Disconnect harness connectors F43, F191.</li> <li>Check harness continuity between harness connector F43 terminal 4 and engine ground.         Continuity should exist.     </li> <li>Also check harness for short to ground and short to power.</li> </ol>				
	OK or NG				
ОК	<b>&gt;</b>	GO TO 10.			
NG	<b>•</b>	GO TO 9.			

9	DETECT MALFUNCTIONING PART		
Check the following.  • Harness connectors F43, F191  • Joint connector-18  • Harness for open or short between harness connector F43 and engine ground			
	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.	

10	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
► INSPECTION END			

Component Description



#### **Component Description**

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0581

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-RPM (POS)	Tachometer: Connect     Run engine and compare tachometer indication with the CONSULT-II	Almost the same speed as the
ENG SPEED	value.	CONSULT-II value.

#### On Board Diagnosis Logic

NFEC02

Malfunction is detected when chipping of the signal plate (flywheel or drive plate) gear tooth (cog) is detected by the ECM.

#### **Possible Cause**

NFEC0582

- Harness or connectors
- Crankshaft position sensor (POS)
- Signal plate (Drive plate/Flywheel)

DTC Confirmation Procedure

#### **DTC Confirmation Procedure**

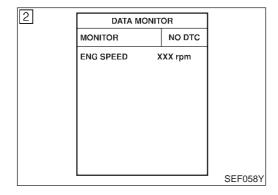
NOTE:

NFEC0295

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V.



#### (P) WITH CONSULT-II

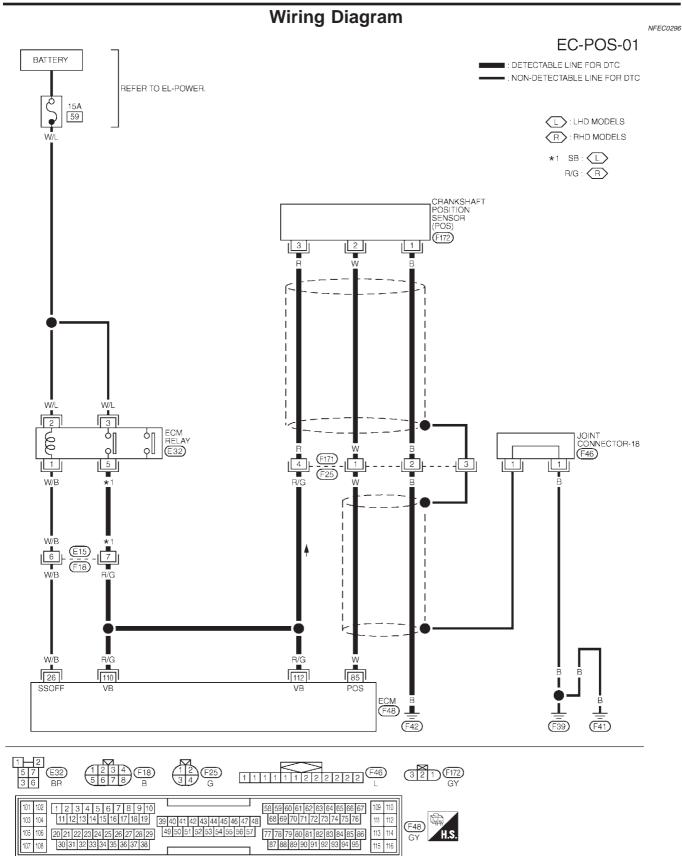
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
- Start engine and run it for at least 70 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-412.

#### **WITH GST**

Follow the procedure "WITH CONSULT-II" above.

NFEC0295S02

Wiring Diagram



MEC850C

Wiring Diagram (Cont'd)

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
QF.	w	CRANKSHAFT POSITION	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	(V) 10 5 0 0.4 ms
85	VV	SENSOR (POS)	ENGINE RUNNING AT 2,000 RPM	(V) 10 5 0 0.4 ms

SEF856Y

### **Diagnostic Procedure**

1 RETIGHTEN GROUND SCERWS

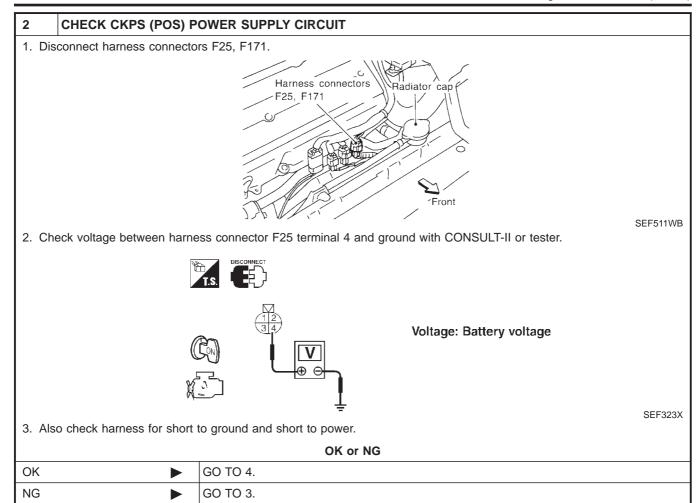
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

Engine ground

Oil filler cap

GO TO 2.

Diagnostic Procedure (Cont'd)



#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F25, F171
- Harness connectors E15, F18
- Harness for open or short between ECM and crankshaft position sensor (POS)
- Harness for open or short between ECM relay and crankshaft position sensor (POS)
  - Repair open circuit or short to ground or short to power in harness or connectors.

# 4 CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT 1. Check harness continuity between harness connector F25 terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power. OK or NG OK Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

NG

# 5 CHECK CKPS (POS) INPUT SIGNAL CIRCUIT 1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 85 and harness connector F25 terminal 1. Refer to Wiring Diagram. Continuity should exist. 3. Also check harness for short to ground and short to power. OK or NG OK GO TO 6.

Repair open circuit or short to ground or short to power in harness or connectors.

# 6 CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT 1. Disconnect CKPS (POS) harness connector. Crankshaft position sensor (POS) harness connector SEF367Q

2. Check harness continuity between CKPS (POS) terminals and harness connector F171 terminals as follows.

CKPS (POS) terminal	Harness connector F171 terminal
1	2
2	1
3	4

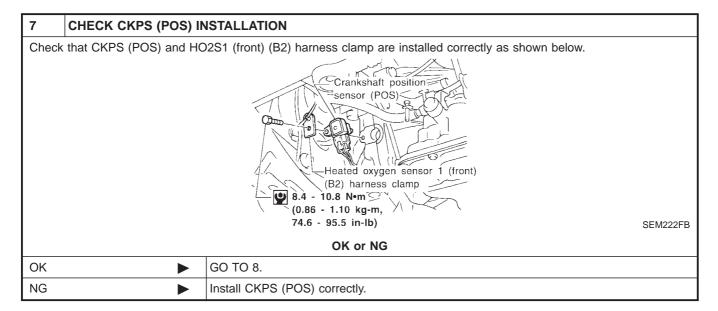
MTBL0352

#### Continuity should exist.

3. Also check harness for short to ground and short to power.

#### OK or NG

OK •	•	GO TO 7.
NG	•	Repair open circuit or short to ground or short to power in harness or connectors.

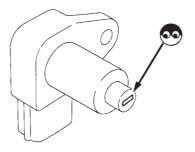


Diagnostic Procedure (Cont'd)

8	8 CHECK IMPROPER INSTALLATION			
2. Red	<ol> <li>Loosen and retighten the fixing bolt of the crankshaft position sensor (POS).</li> <li>Reconnect harness connectors disconnected.</li> <li>Perform "DTC Confirmation Procedure", EC-410 again.</li> </ol>			
	Is a 1st trip DTC P1336 detected?			
Yes	<b>&gt;</b>	GO TO 9.		
No	<b>•</b>	INSPECTION END		

#### 9 CHECK CRANKSHAFT POSITION SENSOR (POS)

- 1. Disconnect crankshaft position sensor (POS) harness connector.
- 2. Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.



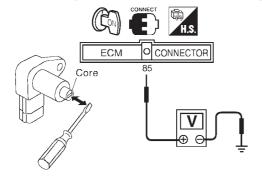
SEF587P

#### OK or NG

OK ▶	GO TO 10.
NG ►	Replace crankshaft position sensor (POS).

#### 10 CHECK CRANKSHAFT POSITION SENSOR (POS)-II

- 1. Reconnect harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdriver.



ECM terminal	Condition	Voltage
CON terminal	Condition	vollage
85	Contacted	Approximately 5V
03	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF324X

#### OK or NG

OK ▶	GO TO 11.
NG ▶	Replace crankshaft position sensor (POS).

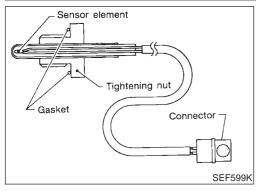
Diagnostic Procedure (Cont'd)

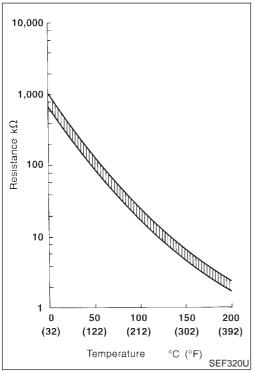
11	11 CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT		
<ol> <li>Disconnect harness connectors F25, F171.</li> <li>Check harness continuity between harness connector F25 terminal 3 and engine ground. Refer to Wiring Diagram.         Continuity should exist.     </li> <li>Also check harness for short to ground and short to power.</li> </ol>			
	OK or NG		
OK	<b>&gt;</b>	GO TO 13.	
NG	<b>•</b>	GO TO 12.	

12	DETECT MALFUNCTIONING PART	
	Check the following.	
	<ul> <li>Harness connectors F25, F171</li> <li>Joint connector-18</li> </ul>	
• Har	<ul> <li>Harness for open or short between harness connector F25 and engine ground</li> </ul>	
	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connectors.

13	CHECK GEAR TOOTH		
Visua	Visually check for chipping signal plate (flywheel or drive plate) gear tooth (cog).		
	OK or NG		
OK	OK ▶ GO TO 14.		
NG	<b>•</b>	Replace the signal plate (flywheel or drive plate).	

14	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	





#### **Component Description**

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases.

This sensor is not directly used to control the engine system. It is used only for the on board diagnosis.

#### <Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 74 (EGR temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

When EGR system is operating.

Voltage: 0 - 1.5V

#### On Board Diagnosis Logic

NFEC0837

Malfunction is detected when

(Malfunction A) an excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low,

(Malfunction B) an excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.

# Possible Cause MALFUNCTION A

NFEC0838

- Harness or connectors (The EGR temperature sensor circuit is shorted.)
- EGR temperature sensor
- Malfunction of EGR function

#### **MALFUNCTION B**

NEEC083850

- Harness or connectors (The EGR temperature sensor circuit is open.)
- EGR temperature sensor

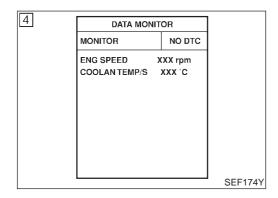
Malfunction of EGR function

#### **DTC Confirmation Procedure**

Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MAL-FUNCTION B".

#### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.



#### PROCEDURE FOR MALFUNCTION A

NFEC0839S01

#### (P) With CONSULT-II

NFEC0839S0101

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Verify that "COOLAN TEMP/S" is less than 40°C (104°F). If the engine coolant temperature is above the range, cool the engine down.
- 4) Start engine and let it idle for at least 8 seconds.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-421.

#### With GST

NFEC0839S0102

Follow the procedure "With CONSULT-II" above.

#### DTC P1401 EGR TEMPERATURE SENSOR

DTC Confirmation Procedure (Cont'd)

4	ACTIVE TES	ST	
	EGR VOL CONT/V	50 step	
	MONITOR		
	ENG SPEED	XXX rpm	
	EGR TEMP SEN	xxx v	
			SEF200\

DATA MONITOR

MONITOR

NO DTC

ENG SPEED XXX rpm
COOLAN TEMP/S XXX 'C
VHCL SPEED SE XXX km/h
THRTL POS SEN XXX V
B/FUEL SCHDL XXX msec

## PROCEDURE FOR MALFUNCTION B CAUTION:

NFEC0839S02

Always drive vehicle at a safe speed.

#### **TESTING CONDITION:**

Always perform the test at a temperature above -10°C (14°F).

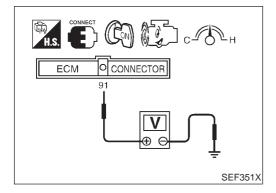
#### (P) With CONSULT-II

FEC0839S020

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 3) Hold engine speed at 1,500 rpm.
- 4) Touch "Qu" and set the EGR volume control valve opening to 50 step and check EGR TEMP SEN. EGR TEMP SEN should decrease to less than 1.0V. If the check result is NG, go to "Diagnostic Procedure", EC-421.
- If the check result is OK, go to the following step.
- 5) Turn ignition switch "OFF" and wait at least 10 seconds.
- 6) Start engine and maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	1,200 - 2,400 rpm
VHCL SPEED SE	10 km/h (6 MPH) or more
B/FUEL SCHDL	More than 4 msec
THRTL POS SEN	0.65 - 1.08V
Selector lever	Suitable position

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-421.



#### With GST

NFEC0839S0202

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
- 3) Select "MODE 1" with GST and maintain the following conditions for at least 5 consecutive seconds.

Engine speed	1,200 - 2,400 rpm
Vehicle speed	10 km/h (6 MPH) or more
Voltage between ECM terminal 91 and ground	0.65 - 1.08V
Selector lever	Suitable position

- 4) Select "MODE 7" with GST.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-421.

# **Wiring Diagram** NFEC0840 EC-EGR/TS-01 EGR TEMPERATURE SENSOR (F73) : DETECTABLE LINE FOR DTC $\langle w \rangle$ : NON-DETECTABLE LINE FOR DTC L : LHD MODELS R: RHD MODELS A: WITH A/T L : < L SB: 8 - F4 - 7 SB 74 58 TCM (TRANSMISSION CONTROL MODULE) (F50): (A) ECM (F48)

MEC008D

(F48)

58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76

77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95

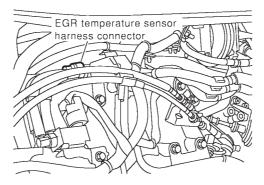
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 20 21 22 23 24 25 26 27 28 29 49 50 51 52 53 54 55 56 57 30 31 32 33 34 35 36 37 38

#### **Diagnostic Procedure**

NFEC0841

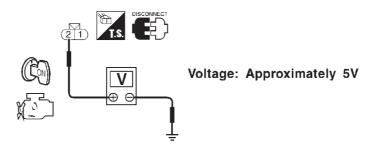
#### 1 CHECK EGR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect EGR temperature sensor harness connector.



SEF277X

- 3. Turn ignition switch "ON".
- 4. Check voltage between EGR temperature sensor terminal 2 and ground with CONSULT-II or tester.



SEF896X

OK	or	NG
----	----	----

OK ▶	GO TO 3.
NG •	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F4, F71
- Harness for open or short between ECM and EGR temperature sensor

Repair or replace harness or connectors.

#### 3 CHECK EGR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between EGR temperature sensor terminal 1 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground or short to power.

#### OK or NG

OK •	GO TO 5.
NG ▶	GO TO 4.

#### **DTC P1401 EGR TEMPERATURE SENSOR**

Diagnostic Procedure (Cont'd)

#### 4 DETECT MALFUNCTIONING PART

Check the following.

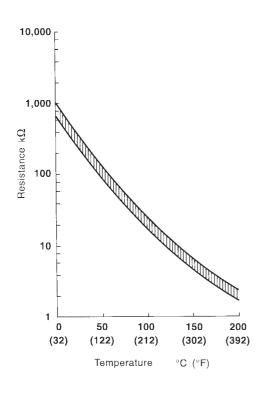
5

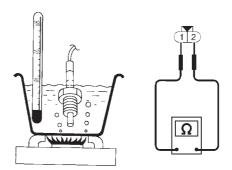
- Harness connectors F4, F71
- Harness for open or short between ECM and EGR temperature sensor
- Harness for open or short between TCM (Transmission Control Module) and EGR temperature sensor

Repair open circuit or short to ground or short to power in harness or connector.

#### CHECK EGR TEMPERATURE SENSOR

- 1. Remove EGR temperature sensor.
- 2. Check resistance between EGR temperature sensor terminals 1 and 2 under the following conditions.





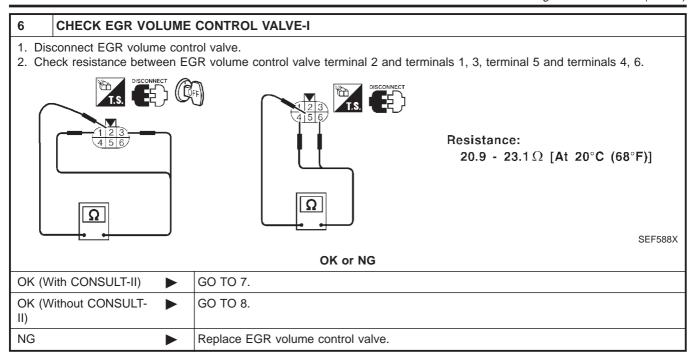
#### <Reference data>

EGR temperature °C (°F)	Voltage V	Resistance $M\Omega$
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

SEF353X

#### OK or NG

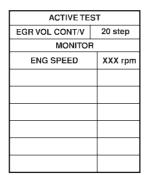
OK •	GO TO 6.
NG ►	Replace EGR temperature sensor.

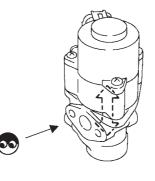


#### 7 CHECK EGR VOLUME CONTROL VALVE-II

#### (P) With CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch ON.
- 4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening steps.





SEF067Y

OK •	•	GO TO 9.
NG	<b>&gt;</b>	Replace EGR volume control valve.

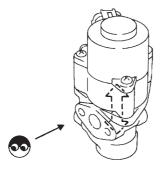
#### **DTC P1401 EGR TEMPERATURE SENSOR**

Diagnostic Procedure (Cont'd)

#### 8 CHECK EGR VOLUME CONTROL VALVE-II

#### Without CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch ON and OFF.
- 4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



SEF560W

OK or NG

OK •	GO TO 9.
NG ▶	Replace EGR volume control valve.

9	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

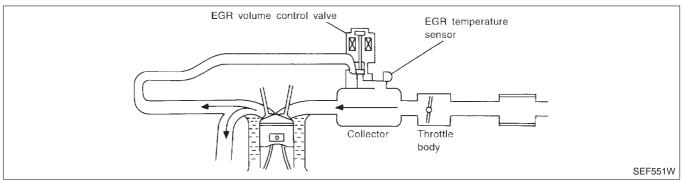
# **Description**SYSTEM DESCRIPTION

NFEC0842 NFEC0842S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Battery	Battery voltage	EGR volume control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
Park/Neutral position switch	Park/Neutral position		
TCM (Transmission Control Module)	Gear position, shifting signal		

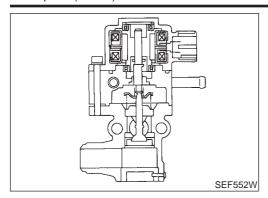
This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage



#### **DTC P1402 EGR FUNCTION (OPEN)**

#### Description (Cont'd)



# COMPONENT DESCRIPTION EGR Volume Control Valve

NFEC0842S02

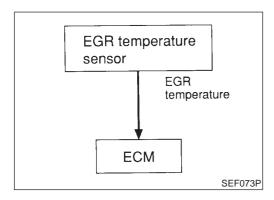
The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

# CONSULT-II Reference Value in Data Monitor Mode

NFEC0843

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	Engine: After warming up		Less than 4.5V
EGR VOL CON/V	Engine: After warming up     Air conditioner switch: "OFF"	Idle	0 step
	Shift lever: "N"     No-load	Revving engine up to 3,000 rpm quickly	10 - 55 step



#### On Board Diagnosis Logic

NEECORAA

If the EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

Malfunction is detected when EGR flow is detected under condition that does not call for EGR.

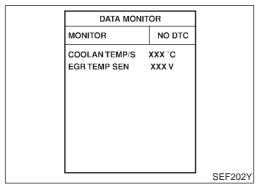
#### NOTE:

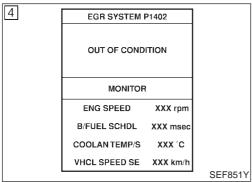
Diagnosis for this DTC will occur when engine coolant temperature is below 50 to 60°C (122 to 140°F). Therefore, it will be better to turn ignition switch "ON" (start engine) at the engine coolant temperature below 30°C (86°F) when starting DTC confirmation procedure.

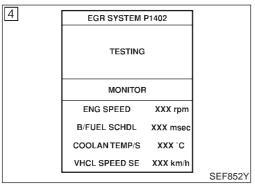
#### **Possible Cause**

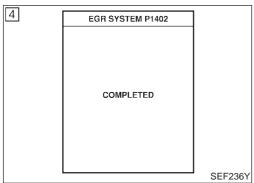
NFEC0845

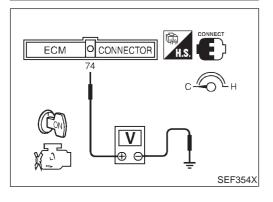
- Harness or connectors (EGR volume control valve circuit is open or shorted.)
- EGR volume control valve leaking or stuck open
- EGR temperature sensor











#### **DTC Confirmation Procedure**

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

#### **TESTING CONDITION:**

- Always perform the test at a temperature above -10°C (14°F).
- Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT-II before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.

COOLAN TEMP/S: -10 to 35°C (14 to 95°F)\* EGR TEMP SEN: Less than 4.8V

If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant temperature or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

\*: Although CONSULT-II screen displays "-10 to 40°C (14 to 104°F)" as a range of engine coolant temperature, ignore it.

#### (P) WITH CONSULT-II

NEEC0846S0

- 1) Turn ignition switch "OFF", and wait at least 10 seconds, and then turn "ON".
- 2) Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
- 3) Touch "START".
- Start engine and let it idle until "TESTING" on CONSULT-II screen is turned to "COMPLETED". (It will take 80 seconds or more.)

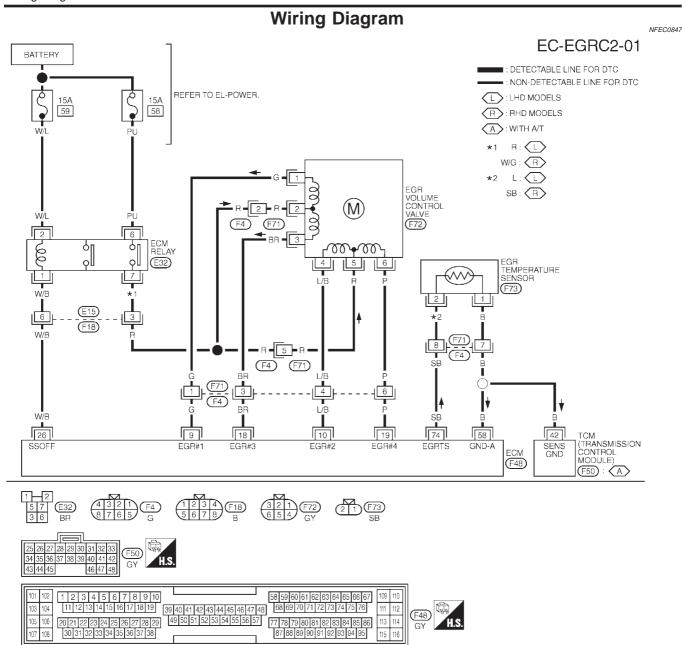
If "TESTING" is not displayed after 5 minutes, turn ignition "OFF" and cool the engine coolant temperature to the range of -10 to  $35^{\circ}$ C (14 to  $95^{\circ}$ F). Retry from step 1.

5) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-429.

#### **WITH GST**

NFEC0846S02

- 1) Turn ignition switch "ON" and select "MODE 1" with GST.
- 2) Check that engine coolant temperature is within the range of -10 to 35°C (14 to 95°F).
- 3) Check that voltage between ECM terminal 74 (EGR temperature sensor signal) and ground is less than 4.8V.
- 4) Start engine and let it idle for at least 80 seconds.
- 5) Stop engine.
- 6) Perform from step 1 to 4.
- 7) Select "MODE 3" with GST.
- 8) If DTC is detected, go to "Diagnostic Procedure", EC-429.
- When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.



MEC852C

#### ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

			<u>*</u>	
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
9	G			
10	L/B	EGR VOLUME CONTROL	  ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
18	BR	VALVE	ENGINE HONNING AT IDLE SPEED	0.1 - 14 V
19	Р			

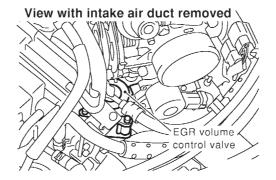
SEF666XB

#### **Diagnostic Procedure**

NFEC0848

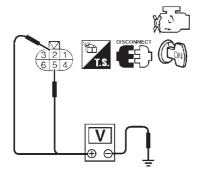
#### 1 CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT

1. Disconnect EGR volume control valve harness connector.



SEF265X

- 2. Turn ignition switch ON.
- 3. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF327X

OK or NG

OK •	GO TO 3.
NG •	GO TO 2.

#### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness connectors F4, F71
- Harness for open or short between ECM relay and EGR volume control valve

Repair harness or connectors.

#### **DTC P1402 EGR FUNCTION (OPEN)**

Diagnostic Procedure (Cont'd)

#### 3 CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
9	1
10	4
18	3
19	6

MTBL0356

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK •	GO TO 5.
NG •	GO TO 4.

#### 4 DETECT MALFUNCTIONING PART

Check the following.

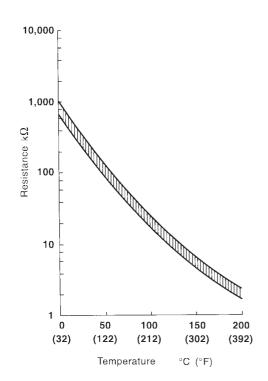
- Harness connectors F4, F71
- Harness for open or short between ECM and EGR volume control valve
  - Repair open circuit or short to ground or short to power in harness or connectors.

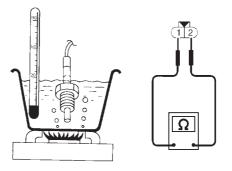
#### CHECK EGR TEMPERATURE SENSOR

1. Remove EGR temperature sensor.

5

2. Check resistance between EGR temperature sensor terminals 1 and 2 under the following conditions.





#### <Reference data>

EGR temperature °C (°F)	Voltage V	Resistance $M\Omega$
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

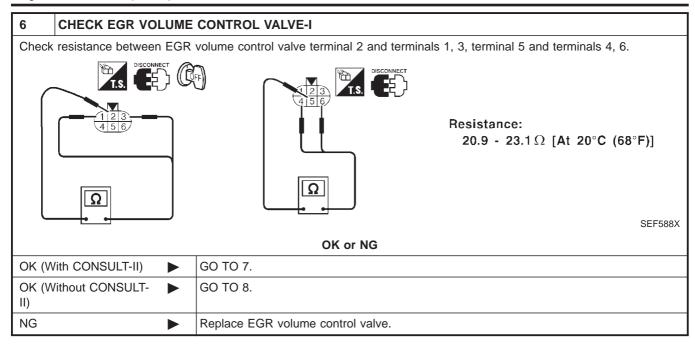
SEF353X

#### OK or NG

OK ▶	GO TO 6.
NG ►	Replace EGR temperature sensor.

#### **DTC P1402 EGR FUNCTION (OPEN)**

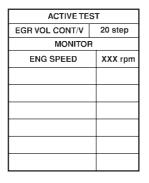
Diagnostic Procedure (Cont'd)

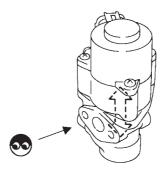


#### 7 CHECK EGR VOLUME CONTROL VALVE-II

#### (P) With CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch "ON".
- 4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening steps.





SEF067Y

OK or NG

OK	GO TO 9.
NG	Replace EGR volume control valve.

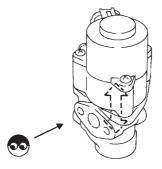
### **DTC P1402 EGR FUNCTION (OPEN)**

Diagnostic Procedure (Cont'd)

### CHECK EGR VOLUME CONTROL VALVE-II

### Without CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch ON and OFF.
- 4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



SEF560W

OK •	GO TO 9.
NG ▶	Replace EGR volume control valve.

9	9 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

### **Component Description**

IFFC0849

The malfunction information related to A/T (Automatic Transmission) is transferred through the line (circuit) from TCM (Transmission control module) to ECM. Therefore, be sure to erase the malfunction information such as DTC not only in TCM (Transmission control module) but also ECM after the A/T related repair.

### On Board Diagnosis Logic

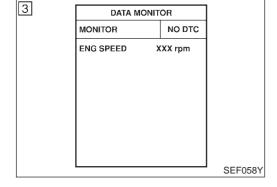
NFEC0850

Malfunction is detected when an incorrect signal from TCM (Transmission control module) is sent to ECM.

### **Possible Cause**

NFEC0851

- Harness or connectors
   [The communication line circuit between ECM and TCM (Transmission control module) is open or shorted.]
- Dead (Weak) battery
- TCM (Transmission control module)



### **DTC Confirmation Procedure**

NFEC0852

### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

### (P) WITH CONSULT-II

NFEC0852S01

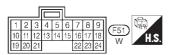
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT-II.
- 3) Start engine and wait at least 40 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-436.

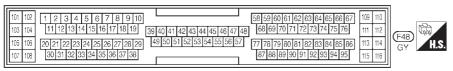
### **WITH GST**

NFEC0852S02

Follow the procedure "WITH CONSULT-II" above.

# Wiring Diagram EC-ATDIAG-01 TCM (TRANSMISSION CONTROL MODULE) OBD2 (EST) BRW ECM (F28)





MEC009D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
60	BR/W	A/T DIAGNOSIS COMMUNICATION LINE	ENGINE RUNNING AT IDLE SPEED	VOLTAGE FLUCTUATES BETWEEN 0 to 2V.

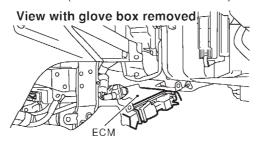
SEF048YA

### **Diagnostic Procedure**

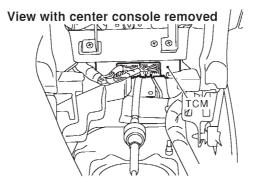
NFEC0854

### CHECK A/T DIAGNOSIS COMMUNICATION LINE INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.



SEF270X



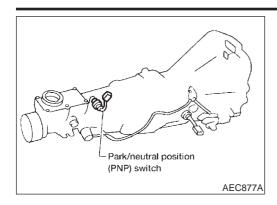
SEF271X

- 3. Check harness continuity between ECM terminal 60 and TCM terminal 15. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

OK ►	GO TO 2.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

2	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
► INSPEC		INSPECTION END

Component Description



### **Component Description**

When the gear position is "P" (A/T models only) or "N", park/neutral position (PNP) switch is "ON".

ECM detects the position because the continuity of the line (the "ON" signal) exists.

For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

### **CONSULT-II** Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0856

MONITOR ITEM	CONDITION		SPECIFICATION
D/N DOSLSW	POSI SW • Ignition switch: ON	Shift lever: "P" or "N"	ON
F/N FOSI 5W		Except above	OFF

### On Board Diagnosis Logic

NFEC08

Malfunction is detected when the signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.

### **Possible Cause**

NFEC0858

- Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.]
- Park/neutral position (PNP) switch

### **DTC Confirmation Procedure**

NFEC0859

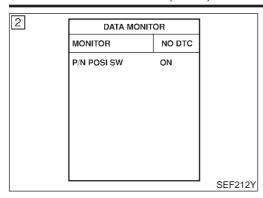
### **CAUTION:**

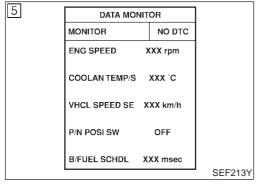
Always drive vehicle at a safe speed.

### NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

DTC Confirmation Procedure (Cont'd)





### (P) WITH CONSULT-II

NFEC0859S01

- 1) Turn ignition switch "ON".
- Select "P/N POSI SW" in "DATA MONITOR" mode with CON-SULT-II. Then check the "P/N POSI SW" signal under the following conditions.

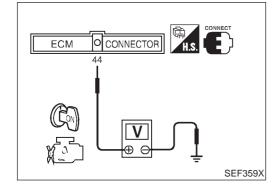
Position (Selector lever)	Known-good signal
"N" and "P" position	ON
Except the above position	OFF

If NG, go to "Diagnostic Procedure", EC-440. If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT-II.
- 4) Start engine and warm it up to normal operating temperature.
- 5) Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,800 - 2,600 rpm (A/T) 1,600 - 2,400 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2 - 10 msec
VHCL SPEED SE	70 - 100 km/h (43 - 62 MPH)
Selector lever	Suitable position

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-440.



### **Overall Function Check**

Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

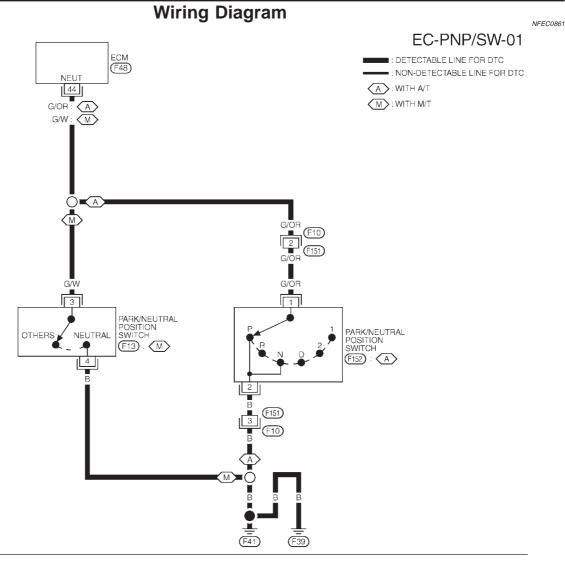
### **WITH GST**

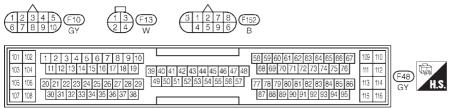
NFEC0860S01

- 1) Turn ignition switch "ON".
- 2) Check voltage between ECM terminal 44 and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known good data)
"P" and "N" position	Approx. 0
Except the above position	Battery voltage

3) If NG, go to "Diagnostic Procedure", EC-440.





MEC757C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

[	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	44			IGN ON WITH GEAR POSITION "N" OR "P"(A/T), GEAR POSITION NEUTRAL (M/T)	APPROX. 0V
	44	G/W (M/T)	(PNP) SWITCH	IGN ON WITHOUT THE ABOVE GEAR POSITION	BATTERY VOLTAGE

SEF635XC

Diagnostic Procedure

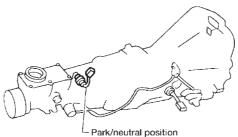
### Diagnostic Procedure FOR M/T MODELS

NFEC0862

NFEC0862S01

### CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect park/neutral position (PNP) switch harness connector.



(PNP) switch

AEC877A

- 3. Check harness continuity between PNP switch terminal 4 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

K	_	r	N	ı

OK	<b></b>	GO TO 2.
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

### 2 CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 44 and PNP switch terminal 3. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

OK	GO TO 3.
NG	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH		
Refer	Refer to MT-9, "Position Switch Check".		
	OK or NG		
OK	<b>•</b>	GO TO 4.	
NG	<b>•</b>	Replace park/neutral position (PNP) switch.	

4	CHECK INTERMITTENT	INTERMITTENT INCIDENT		
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		FOR INTERMITTENT INCIDENT", EC-131.		
► INSPECTION END				

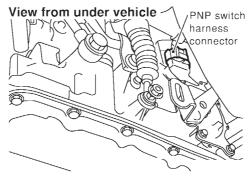
Diagnostic Procedure (Cont'd)

### FOR A/T MODELS

VFFC0862S02

### CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect park/neutral position (PNP) switch harness connector.



SFF279X

- 3. Check harness continuity between PNP switch terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

### OK or NG

OK		GO TO 3.
NG	<b>•</b>	GO TO 2.

### 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F10, F151
- Harness for open or short between park/neutral position (PNP) switch and engine ground

Repair open circuit or short to ground or short to power in harness or connectors.

### 3 CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 44 and PNP switch terminal 1. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

### OK or NG

OK	<b>•</b>	GO TO 5.
NG	<b>•</b>	GO TO 4.

### 4 DETECT MALFUNCTIONING PART

Check the following.

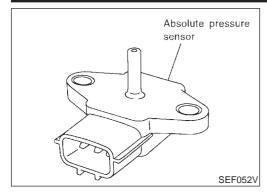
- Harness connectors F10, F151
- Harness for open or short between ECM and park/neutral position (PNP) switch

Repair open circuit or short to ground or short to power in harness or connectors.

### 5 CHECK PARK/NEUTRAL POSITION (PNP) SWITCH Refer to AT-127, "Diagnostic Procedure". OK or NG OK Replace park/neutral position (PNP) switch.

Diagnostic Procedure (Cont'd)

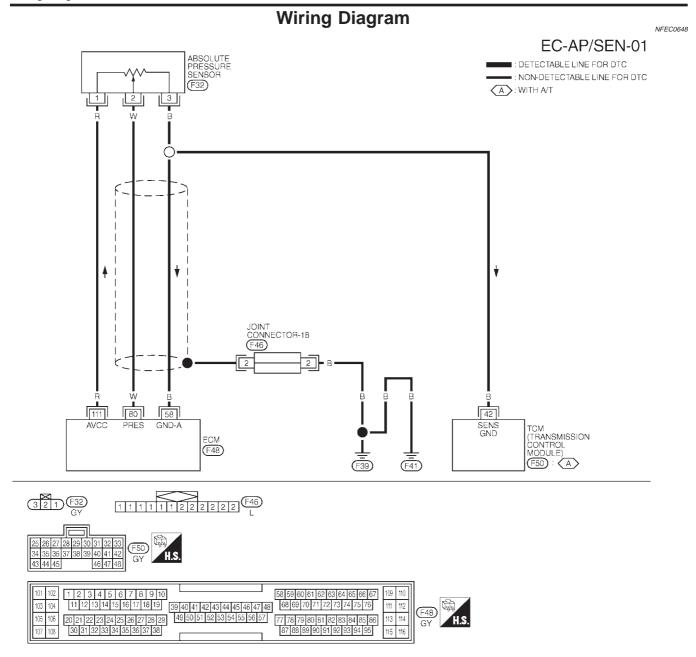
6	CHECK INTERMITTENT INCIDENT		
Refer t	Refer to "TROUBLE DIGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		



### Ambient barometic pressure Vacuum 106.6 13.3 (1,066, 800, 31.50) (133, 100, 3.94) Pressure kPa (mbar, mmHg, inHg) (Absolute pressure)

### **Component Description**

The absolute pressure sensor detects ambient barometric pressure and sends the voltage signal to the ECM. As the pressure increases, the voltage rises.



MEC049D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

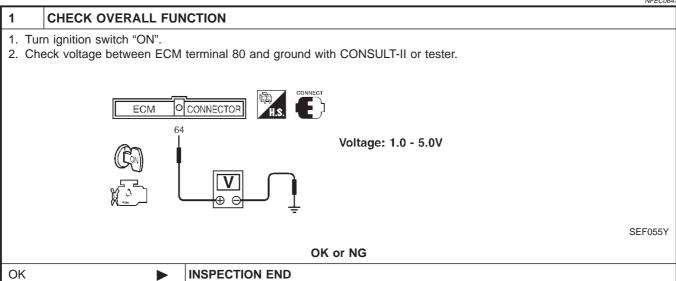
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
80		ABSOLUTE PRESSURE SENSOR	IGN ON	APPROX. 4.4V
111	R	SENSORS' POWER SUPPLY	IGN ON	APPROX. 5V
58	В	SENSORS' GROUND	IGN ON	APPROX. 0V

SEF651XB

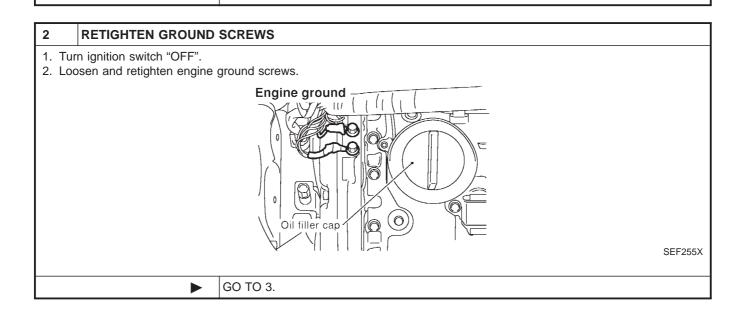
### **Diagnostic Procedure**

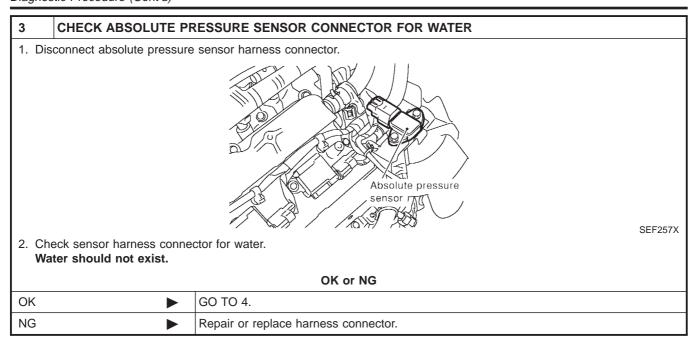
NFEC0647

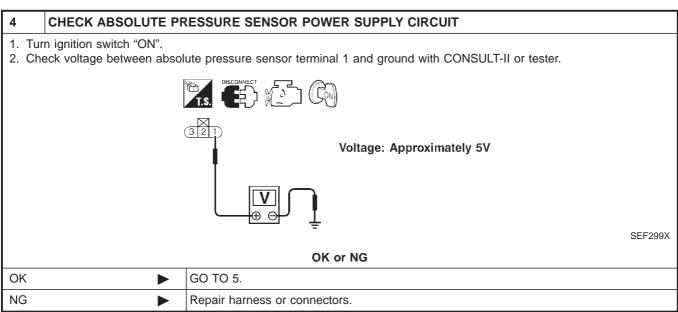


GO TO 2.

NG







5	CHECK ABSOLUTE PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT				
2. Ch Re	Turn ignition switch "OFF".     Check harness continuity between absolute pressure sensor terminal 3 and engine ground.     Refer to Wiring Diagram.     Continuity should exist.     Also check harness for short to ground and short to power.				
	OK or NG				
OK	DK     ▶ GO TO 7.				
NG		<b></b>	GO TO 6.		

### 6 DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and absolute pressure sensor
- Harness for open or short between TCM (Transmission Control Module) and absolute pressure sensor

Repair open circuit or short to ground or short to power in harness or connectors.

### 7 CHECK ABSOLUTE PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

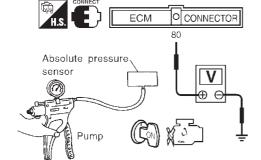
- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 80 and absolute pressure sensor terminal 2.Continuity should exist.
- 3. Also check harness for short to ground and short to power.

### OK or NG

OK •	GO TO 8.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

### 8 CHECK ABSOLUTE PRESSURE SENSOR

- 1. Remove absolute pressure sensor with its harness connector connected.
- 2. Remove hose from absolute pressure sensor.
- 3. Install a vacuum pump to absolute pressure sensor.
- 4. Turn ignition switch "ON" and check output voltage between ECM terminal 80 and engine ground under the following conditions.



Applied vacuum kPa (mbar, mmHg, inHg)	Voltage V
Not applied	3.2 - 4.8
-26.7 (-267, -200, -7.87)	1.0 to 1.4V lower than above value

SEF300XB

### **CAUTION:**

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -93.3 kPa (-933 bar, -700 mmHg, -27.56 inHg) or over 101.3 kPa (1,013 bar, 760 mmHg, 29.92 inHg) of pressure.

OK •	GO TO 9.
NG ▶	Replace absolute pressure sensor.

### **ABSOLUTE PRESSURE SENSOR**

### Diagnostic Procedure (Cont'd)

OK

NG

## 9 CHECK ABSOLUTE PRESSURE SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch "OFF". 2. Disconnect joint connector-18. 3. Check the following. • Continuity between joint connector terminal 2 and ground Refer to Wiring Diagram. • Joint connector (Refer to EL-319, "HARNESS LAYOUT".) Continuity should exist. 4. Also check harness for short to ground and short to power. 5. Then reconnect joint connector-18. OK or NG

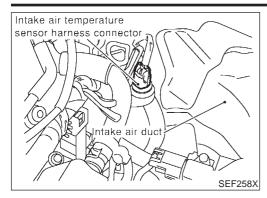
10 CHECK INTERMITTENT INCIDENT		INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

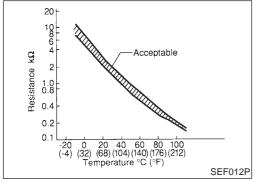
Repair open circuit or short to ground or short to power in harness or connectors.

GO TO 10.

### INTAKE AIR TEMPERATURE SENSOR

Component Description





### **Component Description**

NEECOOS

The intake air temperature sensor is mounted to the air duct housing. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

### <Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.1 - 2.9
80 (176)	1.23	0.27 - 0.38

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ground.

### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

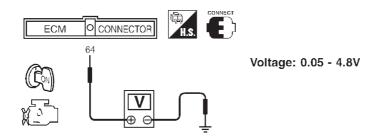
### **Wiring Diagram** NFEC0067 **EC-IATSEN-01** INTAKE AIR TEMPERATURE SENSOR (E12) ■ : DETECTABLE LINE FOR DTC -: NON-DETECTABLE LINE FOR DTC L: LHD MODELS R: RHD MODELS A : WITH A/T 2: (L) 3: R 6 : L 8: R 42 58 GND-A TCM (TRANSMISSION CONTROL MODULE) (F50): (A) SENS GND (F48) 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 49 50 51 52 53 54 55 56 57 MEC064D

### **Diagnostic Procedure**

NFEC0068

### 1 CHECK OVERALL FUNCTION

- 1. Turn ignition switch "ON".
- 2. Check voltage between ECM terminal 64 and ground with CONSULT-II or tester.



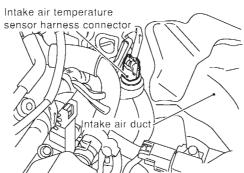
SEF004Y

OK or NG

OK		INSPECTION END
NG	•	GO TO 2.

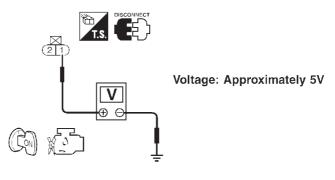
### 2 CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect intake air temperature sensor harness connector.



SEF258X

- 3. Turn ignition switch "ON".
- 4. Check voltage between terminal 1 and ground.



SEF301X

OK •	GO TO 4.
NG ►	GO TO 3.

### INTAKE AIR TEMPERATURE SENSOR

### Diagnostic Procedure (Cont'd)

### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F17
- Harness for open or short between ECM and intake air temperature sensor

Repair harness or connectors.

### 4 CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- Check harness continuity between sensor terminal 2 and engine ground. Refer to Wiring Diagram.

### Continuity should exist.

3. Also check harness for short to ground and short to power.

### OK or NG

OK	► GO TO 6.	
NG	•	GO TO 5.

### 5 DETECT MALFUNCTIONING PART

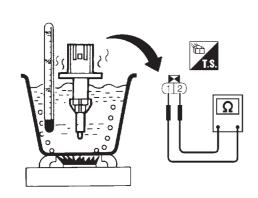
Check the following.

- Harness connectors E8, F17
- Harness for open or short between ECM and intake air temperature sensor
- Harness for open or short between TCM (Transmission Control Module) and intake air temperature sensor

Repair open circuit or short to ground or short to power in harness or connectors.

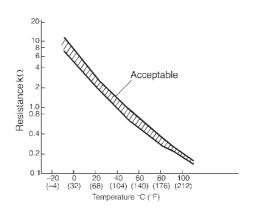
### 6 CHECK INTAKE AIR TEMPERATURE SENSOR

Check resistance between intake air temperature sensor terminals 1 and 2 as shown in the figure.



### <Reference data>

Temperature °C (°F)	Resistance k $\Omega$
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38



SEF302X

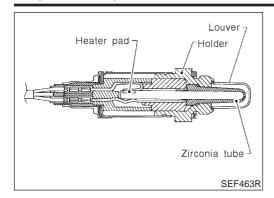
OK •	GO TO 7.
NG ►	Replace intake air temperature sensor.

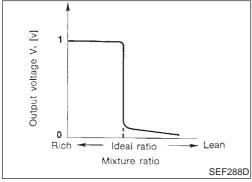
### **INTAKE AIR TEMPERATURE SENSOR**

Diagnostic Procedure (Cont'd)

7	7 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

### Component Description





### **Component Description**

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 (front) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

### **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

MONITOR ITEM	CONE	DITION	SPECIFICATION
HO2S1 (B1) HO2S1 (B2)			0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

### **Wiring Diagram** NFEC0114 **BANK 1** NFEC0114S01 EC-FRO2RH-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) 15A 8 REFER TO EL-POWER. (M19) (M46) HEATED OXYGEN SENSOR 1 (FRONT)(B1) JOINT CONNECTOR-18 F46 (F2) ECM (F48) F41 REFER TO THE FOLLOWING. 11111122222 L 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W M19 -FUSE BLOCK-JUNCTION BOX (J/B) 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 1 2 3 4 5 6 7 8 9 10 39 40 41 42 43 44 45 46 47 48 11 12 13 14 15 16 17 18 19 (F48) 20 21 22 23 24 25 26 27 28 29 77 78 79 80 81 82 83 84 85 86 113 114 30 31 32 33 34 35 36 37 38 80 81 82 83 91 92 93 94 95

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

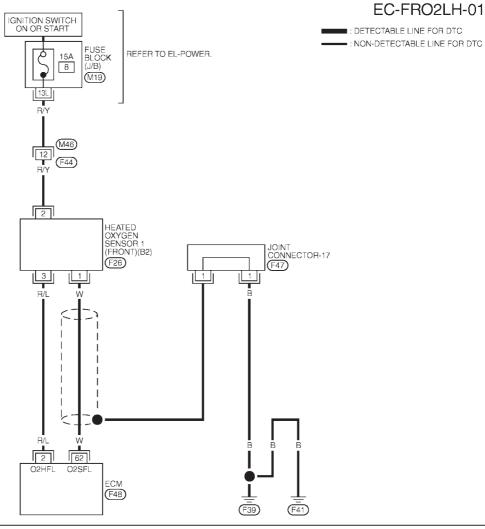
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

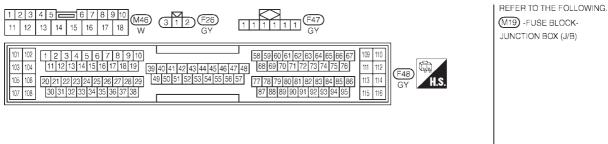
	TO THE ECM	E ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.			
-	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	63	I \//	IHEΔIED OXYGEN	ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s

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MEC065D

### BANK 2





ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS. SUCH AS THE GROUND.

TO THE ECM	THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.			
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
62	I W		ENGINE RUNNING AT 2,000 RPM AFTER WARMING UP TO NORMAL OPERATING TEMPERATURE	0 - APPROX. 1.0V  (V) 1 0.5 0 1 s

SEF855YA

MEC066D

### **Diagnostic Procedure**

NFEC0115

1	INSPECTION START			
Do yo	Do you have CONSULT-II?			
	Yes or No			
Yes	<b>•</b>	GO TO 2.		
No	<b>•</b>	GO TO 3.		

### 2 CHECK OVERALL FUNCTION

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "HO2S1 MNTR (B1)" and "HO2S1 MNTR (B2)" in "DATA MONITOR" mode with CONSULT-II.
- 3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

DATA MON	DATA MONITOR		
MONITOR	NO DTC		
ENG SPEED	XXX rpm		
HO2S1 MNTR (B1)	LEAN		
HO2S1 MNTR (B2)	RICH		

1 time: RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH

2 times: RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH

SEF155Z

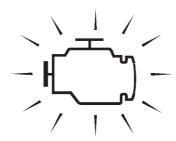
### OK or NG

ОК	<b>&gt;</b>	INSPECTION END
NG	•	GO TO 4.

### 3 CHECK OVERALL FUNCTION

### **⋈** Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and wait at least 10 seconds.
- 3. Set ECM in "Diagnostic test mode II [Heated oxygen sensor 1 monitor (front)]". Refer to "How to Switch Diagnostic Test Modes", EC-63.
- 4. Keep the engine speed at 2,000 rpm under no load, and make sure that the MI comes ON more than five times in 10 seconds.

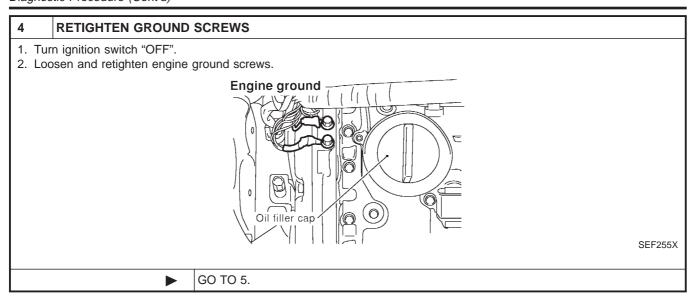


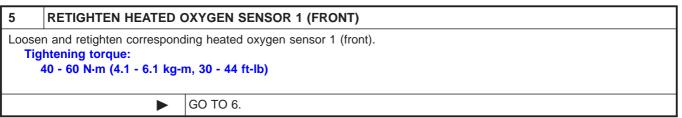
SAT652J

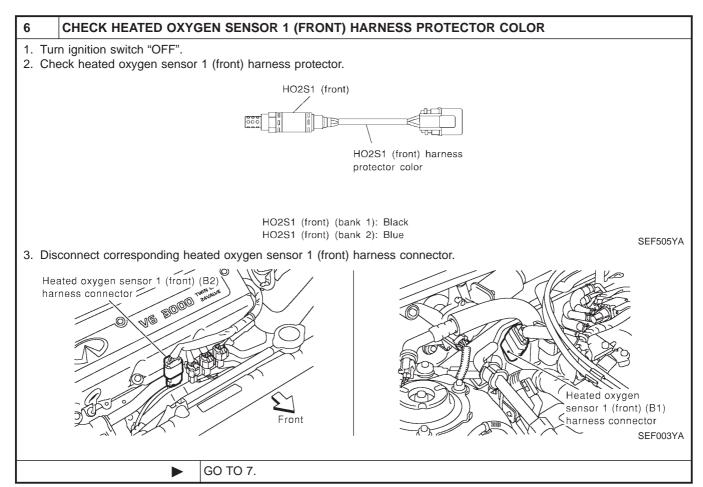
- 5. Switch the monitored sensor. Refer to "How to Switch Monitored Sensor from Bank 1 to Bank 2 or Vice Versa", EC-65.
- 6. Perform step 4 again.

OK •	INSPECTION END
NG •	GO TO 4.

Diagnostic Procedure (Cont'd)







### 7 CHECK HEATED OXYGEN SENSOR 1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

Term	Bank	
ECM	Sensor	Dalik
63	1	1
62	1	2

MTBL0511

### Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 (front) terminal and ground as follows. Refer to Wiring Diagram.

Term	Bank	
ECM or Sensor	Ground	Dank
63 or 1	Ground	1
62 or 1	Ground	2

MTBL0512

### Continuity should not exist.

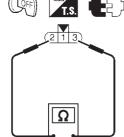
4. Also check harness for short to power.

### OK or NG

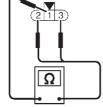
OK	<b></b>	GO TO 8.
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

### 8 CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.







Terminals	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2 1 and 3	$\infty\Omega$ (Continuity should not exist.)

SEF310X

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK (With CONSULT-II)		GO TO 9.
OK (Without CONSULT-II)	<b>•</b>	GO TO 10.
NG	<b></b>	GO TO 11.

Diagnostic Procedure (Cont'd)

### 9 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
- 3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
- 4. Hold engine speed at 2,000 rpm under no load during the following steps.
- 5. Touch "RECORD" on CONSULT-II screen.

DATA MONITOR		
MONITOR	NO DTC	
ENG SPEED	XXX rpm	
MAS A/F SE-B1	xxx v	
COOLAN TEMP/S	XXX °C	
HO2S1 (B1)	XXX V	
HO2S1 MNTR (B1)	LEAN	

SEF646Y

- 6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

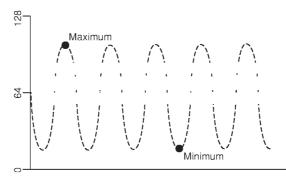
5 times (cycles) are counted as shown below.

R means HO2S1 MNTR (B1)/(B2) indicates RICH L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647YA

- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

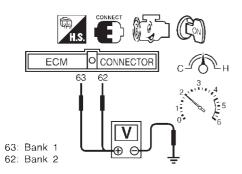
OK ▶	GO TO 12.
NG ►	GO TO 11.

Diagnostic Procedure (Cont'd)

### 10 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Stop engine and set ECM in diagnostic test mode-II [Heated oxygen sensor 1 monitor (front)].
- 3. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 signal) or 62 (HO2S1 bank 1 signal) and engine ground.
- 4. Check the following with engine speed held at 2,000 rpm constant under no load.



- MI comes on more than 5 times within 10 seconds in diagnostic test mode II (Heated oxygen sensor 1 monitor).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

SEF039YA

### **CAUTION:**

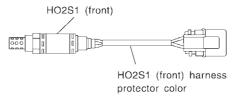
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

### OK or NG

OK ►	GO TO 12.
NG ►	GO TO 11.

### 11 REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

► Replace malfunctioning heated oxygen sensor 1 (front).

Diagnostic Procedure (Cont'd)

NG

## 1. Turn ignition switch "OFF". 2. Disconnect joint connector-17 or joint connector-18. 3. Check the following. • Continuity between joint connector terminal 1 or 2 and ground • Joint connector (Refer to EL-319, "HARNESS LAYOUT".) Continuity should exist. 4. Also check harness for short to ground and short to power. 5. Then reconnect joint connector-17 or joint connector-18. OK or NG

13	3 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

Repair open circuit or short to ground or short to power in harness or connectors.

### **HEATED OXYGEN SENSOR 1 HEATER (FRONT)**

Description

### **Description**

### **SYSTEM DESCRIPTION**

NFEC0123

NFEC0123S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater	Heated oxygen sensor 1
Crankshaft position sensor (REF)	Trigine speed	(front) control	heater (front)

The ECM performs ON/OFF control of the heated oxygen sensor 1 heater (front) corresponding to the engine speed.

### **OPERATION**

NFEC0123S02

Engine speed rpm	Heated oxygen sensor 1 heater (front)
Above 3,600	OFF
Below 3,600	ON

### **CONSULT-II** Reference Value in Data Monitor Mode

### Specification data are reference values.

NFEC0124

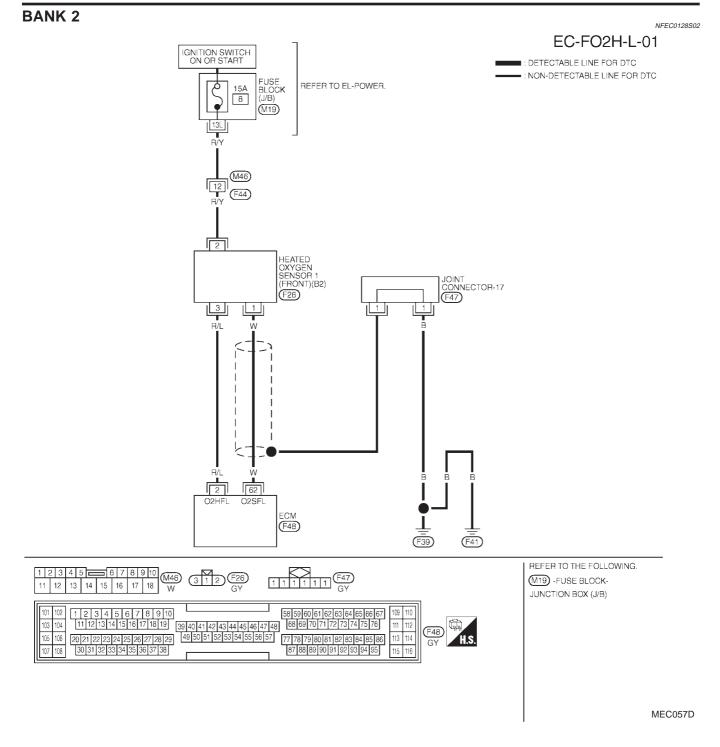
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	• Engine speed: Below 3,600 rpm	ON
HO2S1 HTR (B2)	• Engine speed: Above 3,600 rpm	OFF

### **Wiring Diagram** NFEC0128 **BANK 1** NFEC0128S01 EC-FO2H-R-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC REFER TO EL-POWER. 15A 8 BLOCK (J/B) (M19) (M46) 2 HEATED OXYGEN SENSOR 1 (FRONT)(B1) JOINT CONNECTOR-18 F46 (F2) ECM (F48) F41 (F39) REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W 1 1 1 1 1 1 2 2 2 2 2 2 2 1 F46 M19 -FUSE BLOCK-JUNCTION BOX (J/B) 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 (F48) 20 21 22 23 24 25 26 27 28 29 49 50 51 52 53 54 55 56 57 77 78 79 80 81 82 83 84 85 86 113 114 30 31 32 33 34 35 36 37 38 80 81 82 83 91 92 93 94 95

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE ECM S THANSISTON. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
		HEATED OXYGEN	ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
3	OR/L	SENSOR 1 HEATER (FRONT) (B1)	ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

MEC056D



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE
TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

 			,,,,,	
<b>TERMINAL</b>	WIRE COLOR	ITEM	CONDITION	DATA (DC)
			ENGINE RUNNING BELOW 3,600 RPM	0 - 1.0V
2	R/L	SENSOR 1 HEATER (FRONT) (B2)	ENGINE RUNNING ABOVE 3,600 RPM	BATTERY VOLTAGE

SEF656XC

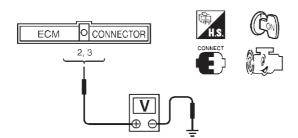
### **HEATED OXYGEN SENSOR 1 HEATER (FRONT)**

### **Diagnostic Procedure**

NFEC0129

### 1 CHECK OVERALL FUNCTION

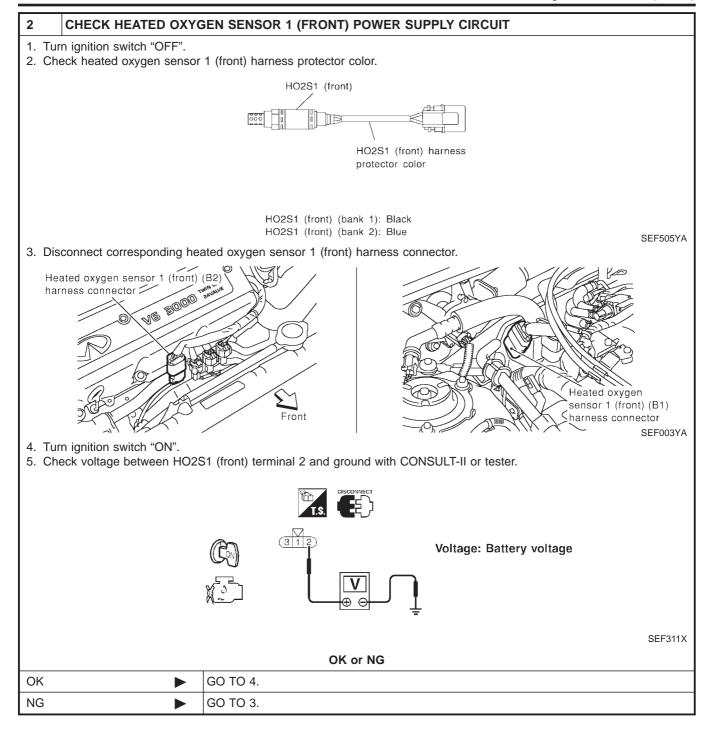
- 1. Turn ignition switch "ON".
- 2. Set the tester probe between ECM terminals 3 (HO2S1 heater bank 1 signal), 2 (HO2S1 heater bank 2 signal) and ground.
- 3. Start engine and let it idle.
- 4. Check the voltage under the following conditions.



Conditions	Voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm.	Battery voltage

SEF007Y

OK •	INSPECTION END
NG ►	GO TO 2.



### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse
  - Repair harness or connectors.

### **HEATED OXYGEN SENSOR 1 HEATER (FRONT)**

Diagnostic Procedure (Cont'd)

### 4 CHECK HEATED OXYGEN SENSOR 1 (FRONT) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal and HO2S1 (front) terminal as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM	Sensor	Dank
3	3	Right
2	3	Left

MTBL0415

### Continuity should exist.

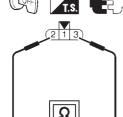
4. Also check harness for short to ground and short to power.

### OK or NG

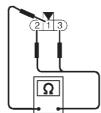
OK •	GO TO 5.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

### 5 CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.







Terminals	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2 1 and 3	$\infty\Omega$ (Continuity should not exist.)

SEF310X

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

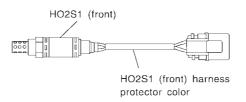
OK ►	GO TO 7.
NG ►	GO TO 6.

#### **HEATED OXYGEN SENSOR 1 HEATER (FRONT)**

Diagnostic Procedure (Cont'd)

#### 6 REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

- 1. Turn ignition switch "OFF".
- 2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black HO2S1 (front) (bank 2): Blue

SEF505YA

#### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

► Replace malfunctioning heated oxygen sensor 1 (front).

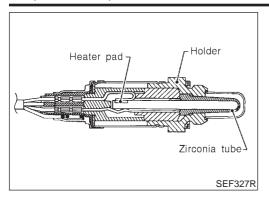
#### 7 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.

► INSPECTION END

#### **HEATED OXYGEN SENSOR 2 (REAR)**

#### Component Description



#### **Component Description**

The heated oxygen sensor 2 (rear), after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each

Even if switching characteristics of the heated oxygen sensor 1 (front) are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2 (rear).

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 (rear) is not used for engine control operation.

#### **CONSULT-II Reference Value in Data Monitor** Mode

Specification data are reference values.

NFEC0147

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	- Faring Afternooning	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	Engine: After warming up		$LEAN \longleftrightarrow RICH$

#### **Wiring Diagram** =NFEC0152 **BANK 1** NFEC0152S01 EC-RRO2RH-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC REFER TO EL-POWER 15A 8 (M19) (F44) 3 OXYGEN SENSOR 2 (REAR)(B1) (F24) 4 JOINT CONNECTOR-17 (F47) O2HRF ECM (F48) F41) REFER TO THE FOLLOWING. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W M19 -FUSE BLOCK-JUNCTION BOX (J/B) 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 (F48) 20 21 22 23 24 25 26 27 28 29 77 78 79 80 81 82 83 84 85 86 113 114 30 31 32 33 34 35 36 37 38 87 88 89 90 91 92 93 94 95

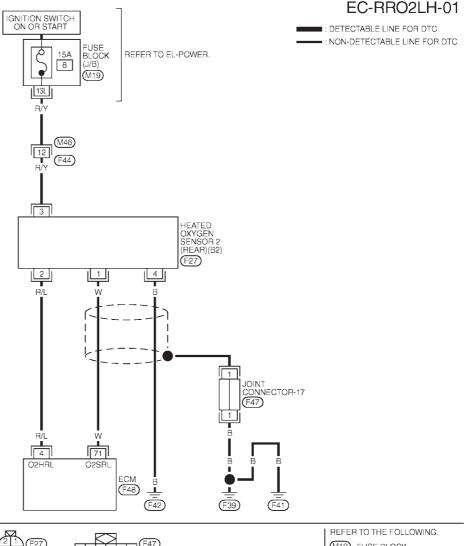
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

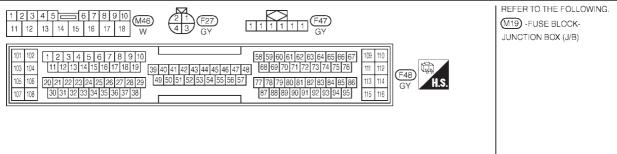
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
72			ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

MEC067D

#### **BANK 2** NFEC0152S02





MEC068D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	. WIRE COLOR	ITEM	CONDITION	DATA (DC)
71	W	HEATED OXYGEN SENSOR 2 (REAR) (B2)	ENGINE RUNNING FROM IDLE UP TO 2,000 RPM UNDER WARM-UP CONDITION	0 - APPROX. 1.0V

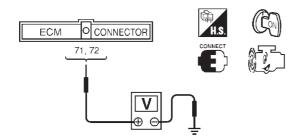
SEF658XC

#### **Diagnostic Procedure**

NFEC0153

#### CHECK OVERALL FUNCTION-I

- 1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle and keep the engine running.
- 3. Set voltmeter probes between ECM terminals 72 (HO2S2 bank 1 signal), 71 (HO2S2 bank 2 signal) and ground.
- 4. Check the voltage while revving up to 4,000 rpm under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)



The voltage does not remain in the range of 0.2 - 0.4V.

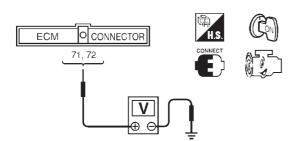
SEF008Y

#### OK or NG

OK •	INSPECTION END
NG •	GO TO 2.

#### 2 CHECK OVERALL FUNCTION-II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminals 71, 72 and ground, or check the voltage when coasting at 80 km/h (50 MPH) in 3rd gear (M/T), "D" position with "OD" OFF (A/T).



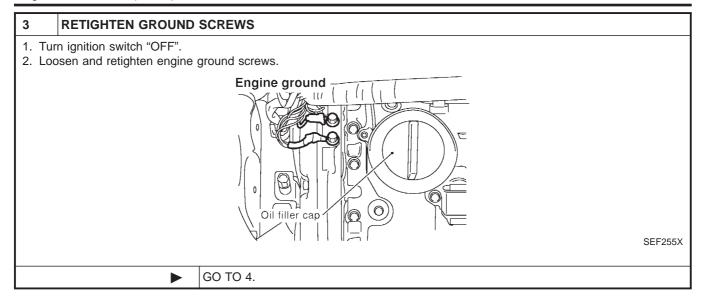
The voltage does not remain in the range of 0.2 - 0.4V.

SEF008Y

OK •	INSPECTION END
NG ►	GO TO 3.

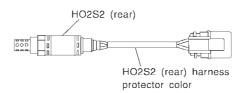
#### **HEATED OXYGEN SENSOR 2 (REAR)**

Diagnostic Procedure (Cont'd)



#### 4 CHECK HEATED OXYTEN SENSOR 2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

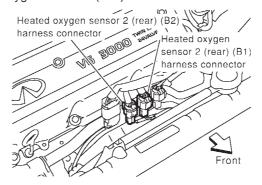
1. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SEF154Z

2. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF467WA

- 3. Disconnect ECM harness connector.
- 4. Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

Terminals		Bank	
ECM	Sensor	- Darik	
72	1	1	
71	1	2	

MTBL0504

#### Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S2 (rear) terminal and ground as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM or Sensor Ground		Dank
72 or 1	Ground	1
71 or 1	Ground	2

MTBL0505

#### Continuity should not exist.

6. Also check harness for short to power.

OK ►	GO TO 5.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

#### **HEATED OXYGEN SENSOR 2 (REAR)**

Diagnostic Procedure (Cont'd)

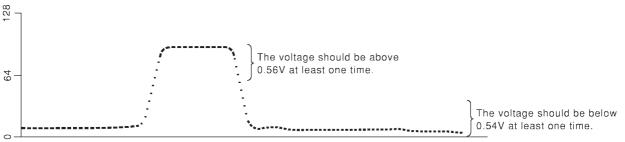
# 5 CHECK HEATED OXYTEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT 1. Check harness continuity between HO2S2 (rear) terminal 4 and engine ground. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power. OK or NG OK (With CONSULT-II) GO TO 6. OK (Without CONSULT- GO TO 7. II) Repair open circuit or short to ground or short to power in harness or connectors

#### 6 CHECK HEATED OXYGEN SENSOR 2 (REAR)

#### (P) With CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
- 4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF066Y

#### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK ▶	GO TO 10.
NG ►	GO TO 9.

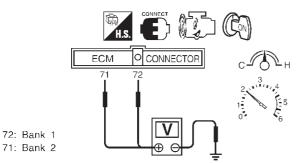
<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

<sup>&</sup>quot;HO2S2 (B1)/(B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

#### 7 CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

#### Without CONSULT-II

- 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle with engine running.
- 3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 signal) or 71 (HO2S2 bank 2 signal) and engine ground.
- 4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times. (Depress and release accelerator pedal as soon as possible.)



The voltage should be above 0.56V at least once during this procedure.

SEF313XB

#### OK or NG

OK •	GO TO 10.
NG ►	GO TO 8.

#### 8 CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).

The voltage should go below 0.54V at least once during this procedure.

#### **CAUTION:**

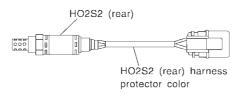
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 10.
NG ►	GO TO 9.

#### 9 REPLACE HEATED OXYGEN SENSOR 2 (REAR)

- 1. Stop vehicle and turn ignition switch "OFF".
- 2. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

#### SEF154Z

#### **CAUTION:**

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

Replace malfunctioning heated oxygen sensor 2 (rear).

#### **HEATED OXYGEN SENSOR 2 (REAR)**

#### Diagnostic Procedure (Cont'd)

NG

# 1. Turn ignition switch "OFF". 2. Disconnect joint connector-17. 3. Check the following. • Continuity between joint connector terminal 1 and ground • Joint connector (Refer to EL-319, "HARNESS LAYOUT".) Continuity should exist. 4. Also check harness for short to ground and short to power. 5. Then reconnect joint connector-17. OK or NG OK

11	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

Repair open circuit or short to ground or short to power in harness or connectors.

Description

#### **Description**

#### **SYSTEM DESCRIPTION**

NFEC0162

NFEC0162S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)		Heated oxygen sensor	
Crankshaft position sensor (REF)	Trigine speed	2 heater (rear) control	2 heater (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater (rear) corresponding to the engine speed.

#### **OPERATION**

NFEC0162S02

Engine speed rpm	Heated oxygen sensor 2 heater (rear)
Above 3,600	OFF
Below 3,600	ON

# **CONSULT-II Reference Value in Data Monitor Mode**

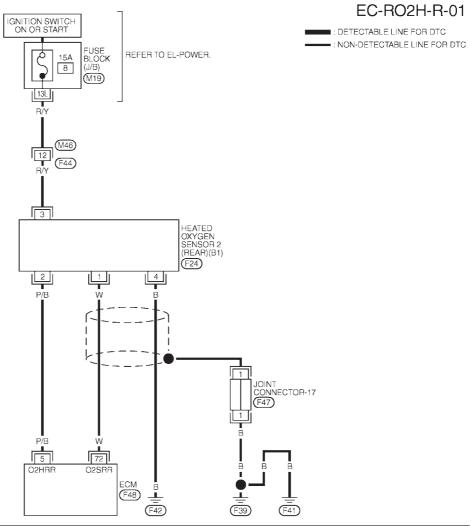
#### Specification data are reference values.

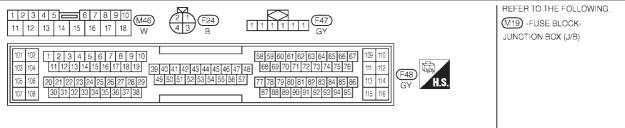
NFEC0163

MONITOR ITEM	CONDITION	SPECIFICATION
HOSSI HTR (B1)	<ul><li>Ignition switch: ON (Engine stopped)</li><li>Engine is running above 3,600 rpm.</li></ul>	OFF
	<ul> <li>Engine is running below 3,600 rpm after driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.</li> </ul>	ON

#### **Wiring Diagram** NFEC0167

## **BANK 1**





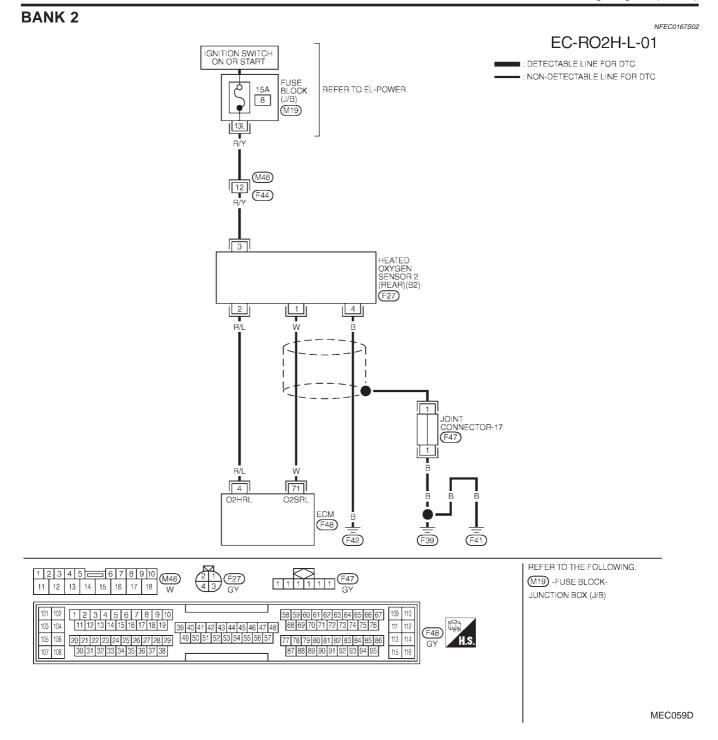
MEC058D

NFEC0167S01

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
			IGN ON	BATTERY VOLTAGE
		HEATED OXYGEN	ENGINE RUNNING ABOVE 3,600 RPM	DALIENT VOLIAGE
5	P/B		ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
		HEATED OXYGEN	IGN ON	BATTERY VOLTAGE
	HEATE		ENGINE RUNNING ABOVE 3,600 RPM	BALLENT VOLIAGE
4	R/L	(REAR) (B2)	ENGINE RUNNING BELOW 3,600 RPM AFTER DRIVING FOR 2 MINITES AT A SPEED OF 70 KM/H (43 MPH) OR MORE	0 - 1.0V

SEF660XC

1

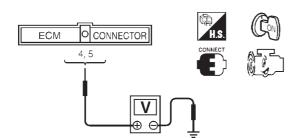
#### **Diagnostic Procedure**

NFEC0168

#### CHECK OVERALL FUNCTION

#### **⋈** Without CONSULT-II

- 1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
- 2. Stop vehicle and keep the engine running.
- 3. Set the voltmeter probe between ECM terminals 5 (HO2S2 heater bank 1 signal), 4 (HO2S2 heater bank 2 signal) and ground.
- 4. Check the voltage under the following conditions.

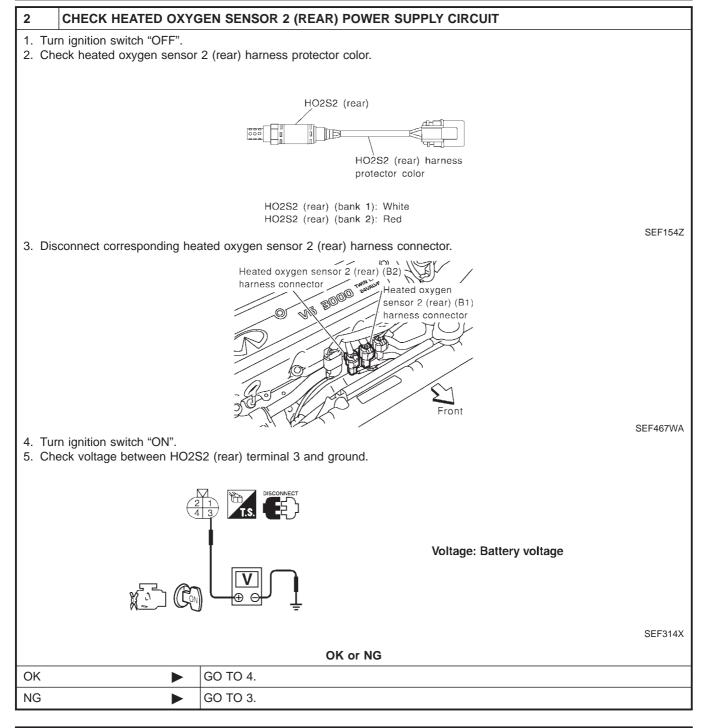


Conditions	Voltage
At idle	0 - 1V
Engine speed is	Battery voltage
above 3,600 rpm.	Dattery voltage

SEF010Y

OK •	INSPECTION END
NG ►	GO TO 2.

Diagnostic Procedure (Cont'd)



#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 (rear) and fuse
  - Repair harness or connectors.

Diagnostic Procedure (Cont'd)

#### 4 CHECK HEATED OXYGEN SENSOR 2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal and HO2S2 (rear) terminal as follows. Refer to Wiring Diagram.

Terminals		Bank
ECM	Sensor	Dank
5	2	1
4	2	2

MTBL0506

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

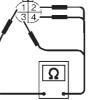
OK •	GO TO 5.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

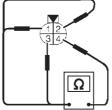
#### 5 CHECK HEATED OXYGEN SENSOR 2 HEATER (REAR)

Check the resistance between HO2S2 (rear) terminals as follows.









Terminal No.	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2, 3, 4	$\infty \Omega$
4 and 1, 2, 3	(Continuity should not exist.)

SEF315X

#### **CAUTION:**

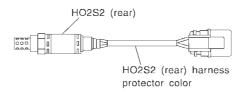
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

#### OK or NG

OK •	GO TO 7.
NG ►	GO TO 6.

#### 6 REPLACE HEATED OXYGEN SENSOR 2 (REAR)

Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White HO2S2 (rear) (bank 2): Red

SFF1547

#### CAUTION:

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner and approved anti-seize lubricant. Refer to "Commercial Service Tools", EC-18.

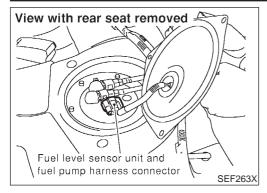
Replace malfunctioning heated oxygen sensor 2 (rear).

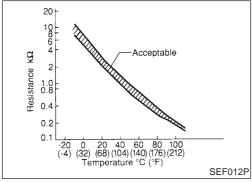
Diagnostic Procedure (Cont'd)

7	7 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

#### **FUEL TANK TEMPERATURE SENSOR**

#### Component Description





#### **Component Description**

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

#### <Reference data>

Fuel temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 92 (Fuel tank temperature sensor) and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

**Wiring Diagram** 

# NFEC0180 EC-FTTSEN-01 FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL TANK TEMPERATURE SENSOR) ■ : DETECTABLE LINE FOR DTC =: NON-DETECTABLE LINE FOR DTC $\langle \mathcal{M} \rangle$ L: LHD MODELS (B19) 5 R : RHD MODELS 1: 🕒 5: R B3 : (L) B2 : R M6): < L M2 : R (R) ECM (F48) (B12) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67 11 12 13 14 15 16 17 18 19 39 40 41 42 43 44 45 46 47 48 68 69 70 71 72 73 74 75 76 20 21 22 123 24 25 27 28 23 49 50 51 55 55 55 77 78 79 80 81 82 83 84 85 86 (F48) 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 113 114

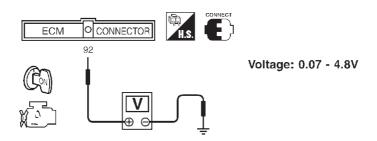
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

#### **Diagnostic Procedure**

NFEC0181

#### 1 CHECK OVERALL FUNCTION

- 1. Turn ignition switch "ON".
- 2. Check voltage between ECM terminal 92 and ground with CONSULT-II or tester.



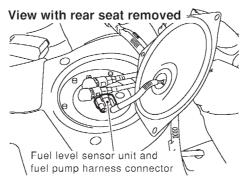
SEF042Y

OK or NG

	OK •		INSPECTION END
ı	NG	•	GO TO 2.

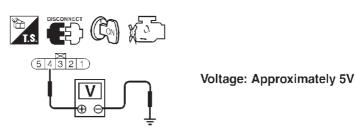
#### 2 CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF263X

- 3. Turn ignition switch "ON".
- 4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.



SEF586X

OK •	GO TO 4.
NG ►	GO TO 3.

#### **FUEL TANK TEMPERATURE SENSOR**

Diagnostic Procedure (Cont'd)

#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M6 or B2, M2
- Harness connectors M81, F49
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

Repair harness or connector.

#### 4 CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

#### Continuity should exist.

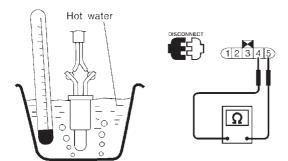
3. Also check harness for short to ground and short to power.

#### OK or NG

OK ►	GO TO 5.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

#### 5 CHECK FUEL TANK TEMPERATURE SENSOR

- 1. Remove fuel level sensor unit.
- 2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.



Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

SEF587X

#### OK or NG

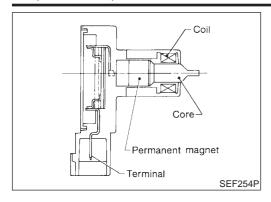
OK •	GO TO 6.
NG ►	Replace fuel level sensor unit.

#### 6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.

INSPECTION END

#### Component Description



#### **Component Description**

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

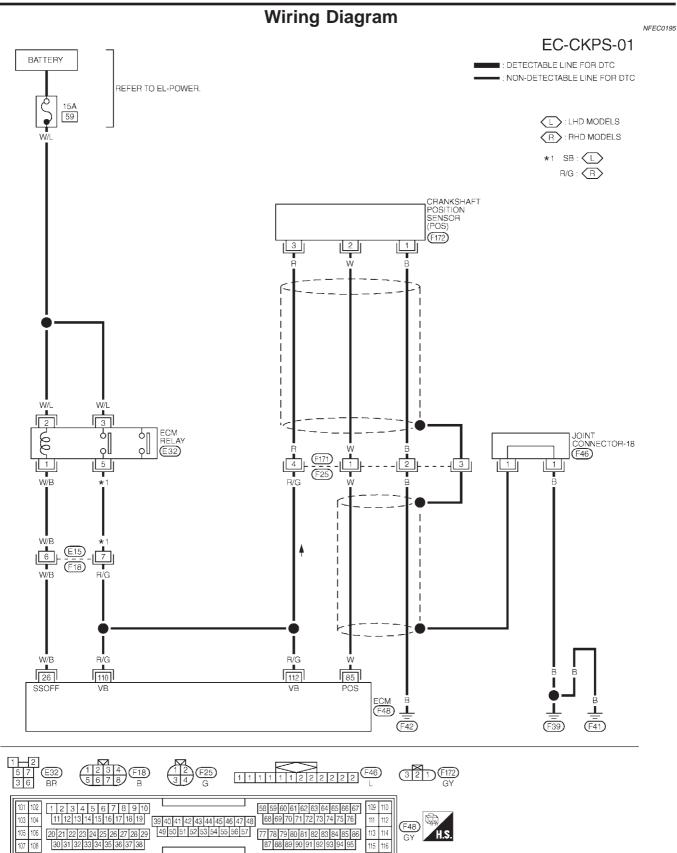
The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

# **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

NFEC0492

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-RPM (POS)	Tachometer: Connect Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.



Wiring Diagram (Cont'd)

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
85	w	CRANKSHAFT POSITION	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	APPROX. 2.4V  (V) 10 5 0
65	VV	CRANKSHAFT POSITION SENSOR (POS)	ENGINE RUNNING AT 2,000 RPM	(V) 10 5 0 10 0.4 ms

SEF856Y

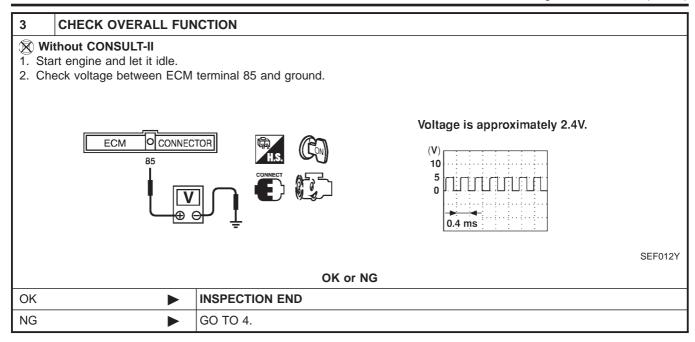
#### **Diagnostic Procedure**

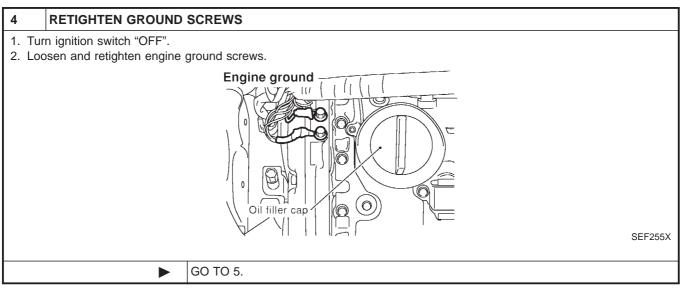
VFFC019

1	INSPECTION START		
Do yo	Do you have CONSULT-II?		
		Yes or No	
Yes	<b>&gt;</b>	GO TO 2.	
No	<b>&gt;</b>	GO TO 3.	

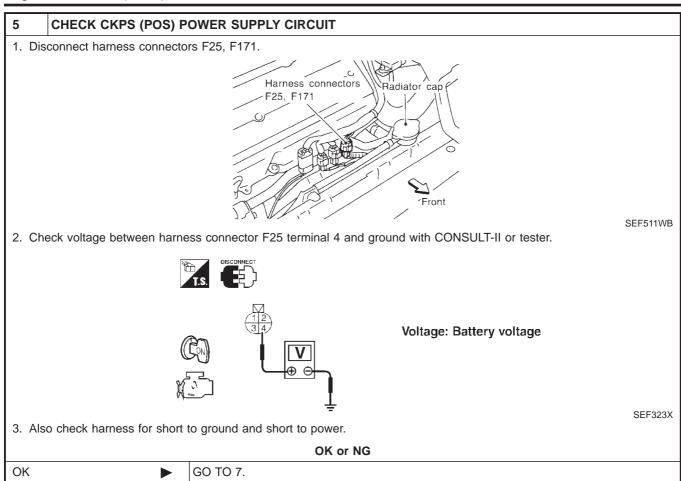
2 0	CHECK OVERAL	L FUN	ICTION			
(P) With	CONSULT-II					
1. Turn	ignition switch "ON	٧".				
2. Seled	ct "POS COUNT" ii	n "DAT	A MONIT	ΓOR" mod	de with CONSULT-II.	
3. Start	engine and let it id	dle.				
4. Chec	ck the "POS COUN	IT" ind	ication.			
	ı				1	
		<b>-</b>	DATA MONIT	T		
		MONITO	R	NO DTC		
		POS CO	UNT	XXX		
					"POS COUNT" indicates 179 - 181.	
					1 00 000111 maloutes 170 101.	
	l					SEF011Y
					OK or NG	
ОК		<b>•</b>	INSPEC	TION EN	ND	
NG		<b>•</b>	GO TO	4.		

Diagnostic Procedure (Cont'd)





Diagnostic Procedure (Cont'd)



#### 6 DETECT MALFUNCTIONING PART

Check the following.

NG

- Harness connectors F25, F171
- Harness connectors E15, F18
- Harness for open or short between ECM and crankshaft position sensor (POS)

GO TO 6.

- Harness for open or short between ECM relay and crankshaft position sensor (POS)
  - Repair open circuit or short to ground or short to power in harness or connectors.

# 7 CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT 1. Check harness continuity between harness connector F25 terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist. 2. Also check harness for short to ground and short to power. OK or NG OK Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

#### 8 CHECK CKPS (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 85 and harness connector F25 terminal 1. Refer to Wiring Diagram.

#### Continuity should exist.

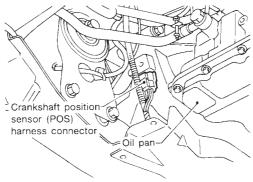
3. Also check harness for short to ground and short to power.

#### OK or NG

OK •	GO TO 9.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

#### 9 CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF367Q

2. Check harness continuity between CKPS (POS) terminals and harness connector F171 terminals as follows.

CKPS (POS) terminal	Harness connector F171 terminal
1	2
2	1
3	4

MTBL0352

#### Continuity should exist.

3. Also check harness for short to ground and short to power.

#### OK or NG

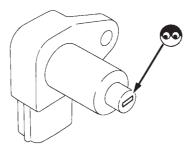
OK		GO TO 10.
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

#### 10 **CHECK CKPS (POS) INSTALLATION** Check that CKPS (POS) and HO2S1 (front) (B2) harness clamp are installed correctly as shown below. Crankshaft position sensor (POS) -Heated oxygen sensor 1 (front) (B2) harness clamp 8.4 - 10.8 N·m 🗩 (0.86 - 1.10 kg-m, 74.6 - 95.5 in-lb) SEM222FB OK or NG GO TO 11. OK NG Install CKPS (POS) correctly.

Diagnostic Procedure (Cont'd)

#### 11 CHECK CRANKSHAFT POSITION SENSOR (POS)-I

- 1. Disconnect crankshaft position sensor (POS) harness connector.
- 2. Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.



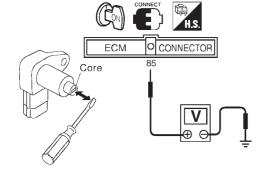
SEF587P

OK	or	N	G
----	----	---	---

OK ►	GO TO 12.
NG ►	Replace crankshaft position sensor (POS).

#### 12 CHECK CRANKSHAFT POSITION SENSOR (POS)-II

- 1. Reconnect disconnected harness connectors.
- 2. Turn ignition switch "ON".
- 3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdrivers



ECM terminal	Condition	Voltage
85	Contacted	Approximately 5V
35	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF324X

#### OK or NG

OK •	•	GO TO 13.
NG	•	Replace crankshaft position sensor (POS).

#### 13 CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect harness connectors F25, F171.
- 2. Check harness continuity between harness connector F25 terminal 3 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

OK •	GO TO 15.
NG ►	GO TO 14.

Diagnostic Procedure (Cont'd)

#### 14 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F25, F171
- Joint connector-18
- Harness for open or short between harness connector F25 and engine ground

Repair open circuit or short to ground or short to power in harness or connectors.

15	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

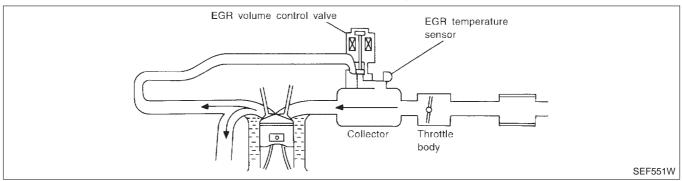
# **Description SYSTEM DESCRIPTION**

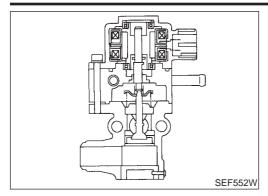
NFEC0497 NFEC0497S01

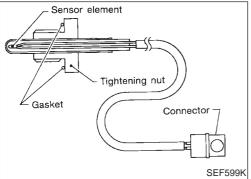
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		EGR volume control valve
Battery	Battery voltage	EGR volume control	
Mass air flow sensor	Amount of intake air		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		
TCM (Transmission Control Module)	Gear position, shifting signal		

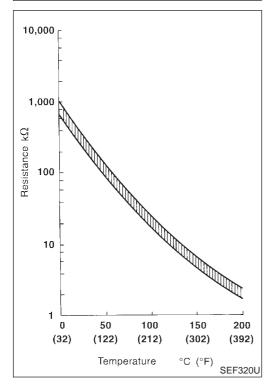
This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage









# COMPONENT DESCRIPTION EGR volume control valve

NFEC0497S02

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

#### **EGR Temperature Sensor**

NFEC0497S020

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.

#### <Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 74 (EGR temperature sensor) and ground.

When EGR system is operating.

Voltage: 0 - 1.5V

#### CAUTION:

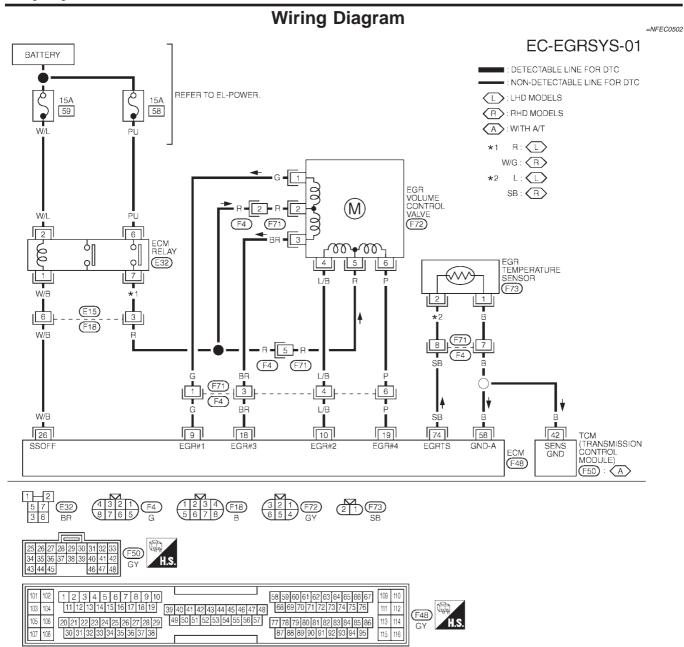
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0498

MONITOR ITEM	CONE	SPECIFICATION	
EGR TEMP SEN	Engine: After warming up		Less than 4.5V
	Engine: After warming up     Air conditioner switch: "OFF"	Idle	0 step
EGR VOL CON/V	Shift lever: "N"     No-load	Revving engine up to 3,000 rpm quickly	10 - 55 step



MEC069D

### ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
9	G			
10		EGR VOLUME CONTROL	  ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
18	BR	VALVE	LIVATIVE NOTIVITIVA AT TIDEE STEED	U.1 - 14V
19	Р			

SEF666XB

#### **Diagnostic Procedure**

NFEC0503

1	INSPECTION START				
Do you	Do you have CONSULT-II?				
	Yes or No				
Yes	<b>&gt;</b>	GO TO 2.			
No	<b>•</b>	GO TO 4.			

#### 2 CHECK OVERALL FUNCTION-I

#### (P) With CONSULT-II

- 1. Turn ignition switch "ON".
- 2. Select "DATA MONITOR" mode with CONSULT-II.
- 3. Confirm that "COOLAN TEMP/S" indicates less than 40°C (104°F). If the indication is out of range, cool the engine down.

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX °C

SEF013Y

- 4. Start engine and let it idle.
- 5. Make sure that "EGR TEMP SEN" in "DATA MONITOR" mode indicates more than 3V. Print out the screen or note the indication.

DATA MONITOR	
NO DTC	
xxx v	

SEF014Y

OK ►	GO TO 3.
NG ►	GO TO 6.

#### **EGR VOLUME CONTROL SYSTEM**

Diagnostic Procedure (Cont'd)

#### 3 CHECK OVERALL FUNCTION-II

#### (P) With CONSULT-II

- 1. Warm up engine to normal operating temperature.
- 2. Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 3. Keep engine speed at 2,000 rpm and set the "EGR VOL CONT/V" opening to "20 step".
- 4. Make sure the "EGR TEMP SEN" indicated is lower than the value indicated in test No. 2 by 1.0V or more.

ACTIVE TEST		
EGR VOL CONT/V	20 step	
MONITOR	1	
ENG SPEED	XXX rpm	
EGR TEMP SEN	xxx v	

SEF015Y

#### OK or NG

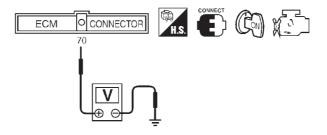
OK •	INSPECTION END
NG ►	GO TO 6.

#### 4 CHECK OVERALL FUNCTION-I

#### Without CONSULT-II

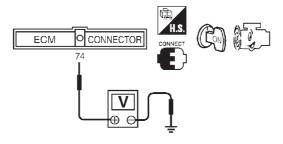
- 1. Turn ignition switch "ON".
- 2. Confirm that the voltage between ECM terminal 70 (Engine coolant temperature sensor signal) and ground is more than 2.72V.

If the voltage is out of range, cool the engine down.



SEF016Y

- 3. Start engine and let it idle.
- 4. Make sure that the voltage between ECM terminal 74 (EGR temperature sensor signal) and ground is more than 3V.



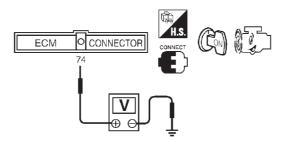
SEF017Y

OK •	GO TO 5.
NG ▶	GO TO 6.

#### 5 CHECK OVERALL FUNCTION-II

#### Without CONSULT-II

- 1. Warm up engine to normal operating temperature.
- 2. Rev engine from idle up to about 3,000 rpm two to three times.
- 3. Make sure the voltage between ECM terminal 74 and ground is lower than the voltage measured in test No. 4 by 1.0V or more



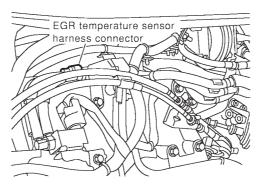
SEF017Y

0	K	٥r	NC	

OK •	INSPECTION END
NG ►	GO TO 6.

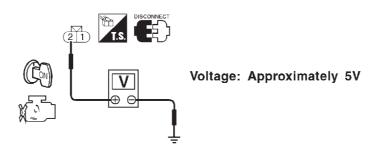
#### 6 CHECK EGR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect EGR temperature sensor harness connector.



SEF277X

- 3. Turn ignition switch "ON".
- 4. Check voltage between EGR temperature sensor terminal 2 and ground with CONSULT-II or tester.



SEF896X

OK ►	GO TO 8.
NG ▶	GO TO 7.

#### **EGR VOLUME CONTROL SYSTEM**

Diagnostic Procedure (Cont'd)

# 7 DETECT MALFUNCTIONING PART Check the following. • Harness connectors F4, F71 • Harness for open or short between ECM and EGR temperature sensor Repair or replace harness or connectors.

8	CHECK EGR TEMPERA	ATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT	
2. Ch	Turn ignition switch "OFF".     Check harness continuity between EGR temperature sensor terminal 1 and engine ground. Refer to Wiring Diagram.     Continuity should exist.     Also check harness for short to ground or short to power.		
	OK or NG		
ОК	<b>&gt;</b>	GO TO 10.	
NG	<b>&gt;</b>	GO TO 9.	

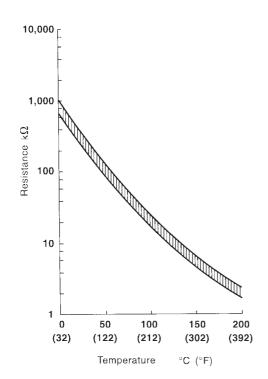
9	DETECT MALFUNCTIO	NING PART
Check the following.  • Harness connectors F4, F71  • Harness for open or short between ECM and EGR temperature sensor  • Harness for open or short between TCM (Transmission Control Module) and EGR temperature sensor		
	<b>•</b>	Repair open circuit or short to ground or short to power in harness or connector.

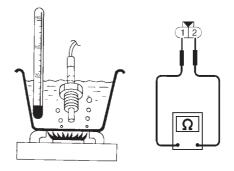
#### CHECK EGR TEMPERATURE SENSOR

1. Remove EGR temperature sensor.

10

2. Check resistance between EGR temperature sensor terminals 1 and 2 under the following conditions.





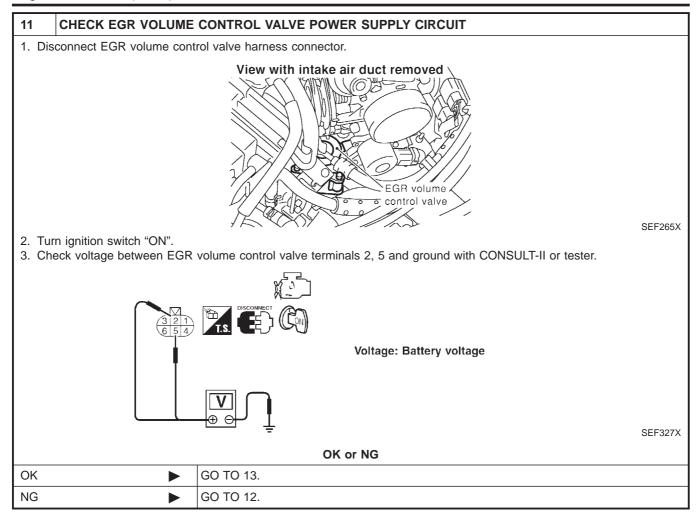
#### <Reference data>

EGR temperature °C (°F)	Voltage V	Resistance $M\Omega$
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

SEF353X

#### OK or NG

	OK •	GO TO 11.
ı	NG •	Replace EGR temperature sensor.



#### 12 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness connectors F4, F71
- Harness for open or short between ECM relay and EGR volume control valve
  - Repair harness or connectors.

#### 13 CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
9	1
10	4
18	3
19	6

MTBL0356

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

	-	_			_
O	ĸ.	റ	r	N	( -

OK •	GO TO 15.
NG ►	GO TO 14.

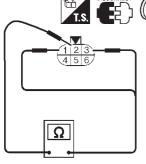
#### 14 DETECT MALFUNCTIONING PART

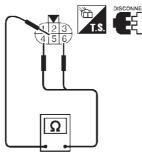
Check the following.

- Harness connectors F4, F71
- Harness for open or short between ECM and EGR volume control valve

Repair open circuit or short to ground or short to power in harness or connectors.

# 1. Disconnect EGR volume control valve. 2. Check resistance between EGR volume control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.





Resistance:

20.9 - 23.1  $\Omega$  [At 20°C (68°F)]

SEF588X

OK	or	N	G
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OK (With CONSULT-II)	<b></b>	GO TO 16.
OK (Without CONSULT-II)	•	GO TO 17.
NG	<b>•</b>	Replace EGR volume control valve.

#### **EGR VOLUME CONTROL SYSTEM**

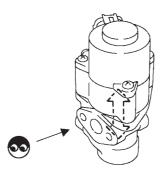
Diagnostic Procedure (Cont'd)

#### 16 CHECK EGR VOLUME CONTROL VALVE-II

#### (P) With CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch ON.
- 4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening steps.

ACTIVE TEST		
EGR VOL CONT/V	20 step	
MONITOR		
ENG SPEED	XXX rpm	



SEF067Y

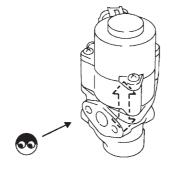
			_
OK	or	Ν	G

OK •	GO TO 18.
NG •	Replace EGR volume control valve.

#### 17 CHECK EGR VOLUME CONTROL VALVE-II

#### Without CONSULT-II

- 1. Remove EGR volume control valve.
- 2. Reconnect ECM harness connector and EGR volume control valve harness connector.
- 3. Turn ignition switch ON and OFF.
- 4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



SEF560W

OK or NG

OK •	GO TO 18.
NG ►	Replace EGR volume control valve.

18	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	<b>•</b>	INSPECTION END	

Description

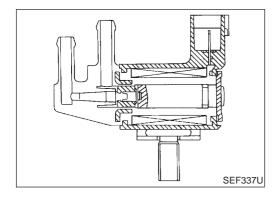
# Description SYSTEM DESCRIPTION

NFEC0221

NFEC0221S01

			1VI EC0221301
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)	]	
Mass air flow sensor	Amount of intake air	]	
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal	EVAP canister purge flow control  EVAP canister purge vume control solenoid vume control	EVAD againter pures val
Throttle position sensor	Throttle position		ume control solenoid valve
Throttle position switch	Closed throttle position	- 1101	
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed	1	

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



#### **COMPONENT DESCRIPTION**

NFEC0221S0

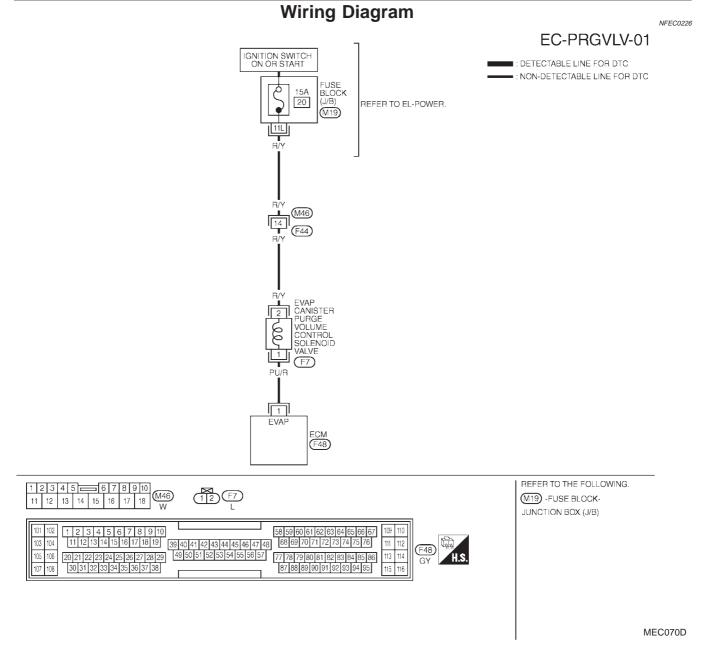
The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

NFEC0222

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	<ul><li>Air conditioner switch "OFF"</li><li>Shift lever: "N"</li></ul>	Idle (Vehicle stopped)	0%
FORG VOL C/V		2,000 rpm	_



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR, USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
			ENGINE RUNNING AT IDLE SPEED	(V) 40 20 0 50 ms
1			ENGINE RUNNING AT 2,000 RPM (MORE THAN 100 SECONDS AFTER STARTING ENGINE)	BATTERY VOLTAGE  (V) 40 20 0 50 ms

SEF858Y

Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0227

1	INSPECTION START	
Do yo	Do you have CONSULT-II?	
Yes or No		
Yes	<b>&gt;</b>	GO TO 2.
No	<b>•</b>	GO TO 3.

#### 2 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE CONTROL FUNCTION

#### (P) With CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Disconnect the EVAP purge hose connected to the EVAP canister purge volume control solenoid valve at the EVAP canister.
- 3. Turn ignition switch "ON" and select "PURG VOL CONT/V" in "DATA MONITOR" mode with CONSULT-II.
- 4. Start engine and let it idle.
- 5. Change the valve opening percentage "Qu" and "Qd" and check for vacuum existence under the following conditions.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
A/F ALPHA-B2	XX %
HO2S1 MNTR (B1)	LEAN
HO2S1 (B2)	LEAN
THRTL POS SEN	X. XX V

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.

SEF156Z

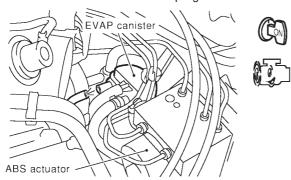
#### OK or NG

OK •	GO TO 4.
NG ►	GO TO 5.

#### 3 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE CONTROL FUNCTION

#### **⋈** Without CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Disconnect the EVAP purge hose connected to the EVAP canister purge volume control solenoid valve at the EVAP canister.
- 3. Start engine and let it idle for at least 80 seconds.
- 4. Check for vacuum existence at the EVAP purge hose under the following conditions.



Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.

SEF019Y

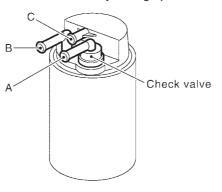
OK or NG

ŀ	OK ►	GO TO 4.
Г	NG ►	GO TO 5.

Diagnostic Procedure (Cont'd)

#### 4 CHECK EVAP CANISTER

- 1. Turn ignition switch "OFF".
- 2. Remove EVAP canister.
- 3. Block port B of EVAP canister.
- 4. Blow air through port A orally, and confirm that air flows freely through port C with check valve resistance.
- 5. Block port A of EVAP canister.
- 6. Blow air through port B orally, and confirm that air flows freely through port C.



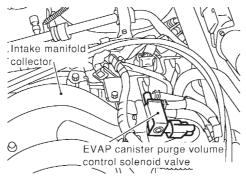
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ı	OK •	<b>•</b>	INSPECTION END
	NG		Replace EVAP canister.

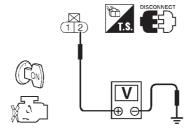
#### 5 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF266X

- 3. Turn ignition switch "ON".
- 4. Check voltage between EVAP canister purge volume control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF998X

OK •	GO TO 7.
NG ►	GO TO 6.

Diagnostic Procedure (Cont'd)

#### 6 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connector M19
- 15A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

Repair harness or connectors.

### 7 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 1 and EVAP canister purge volume control solenoid valve terminal 1. Refer to Wiring Diagram.

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

OK (With CONSULT-II)	<b>•</b>	GO TO 8.
OK (Without CONSULT-II)	<b>•</b>	GO TO 9.
NG	<b>•</b>	Repair open circuit or short to ground and short to power in harness or connetors.

#### 8 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

#### With CONSULT-II

- 1. Start engine.
- 2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that engine speed varies according to the valve opening.

ACTIVE TEST		
PURG VOL CONT/V	XXX %	
MONITOR		
ENG SPEED	XXX rpm	
A/F ALPHA-B1	XX %	
A/F ALPHA-B2	XX %	
HO2S1 MNTR (B1)	LEAN	
HO2S1 MNTR (B2)	LEAN	
THRTL POS SEN	x. xx v	

SEF677Y

#### OK or NG

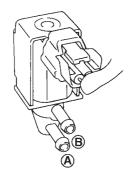
OK ▶	GO TO 10.
NG ►	GO TO 9.

Diagnostic Procedure (Cont'd)

#### CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### (P) With CONSULT-II

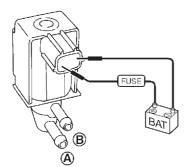
Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

Without CONSULT-II
Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



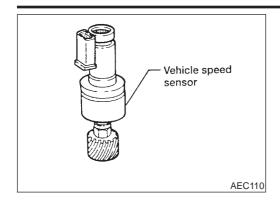
Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

#### OK or NG

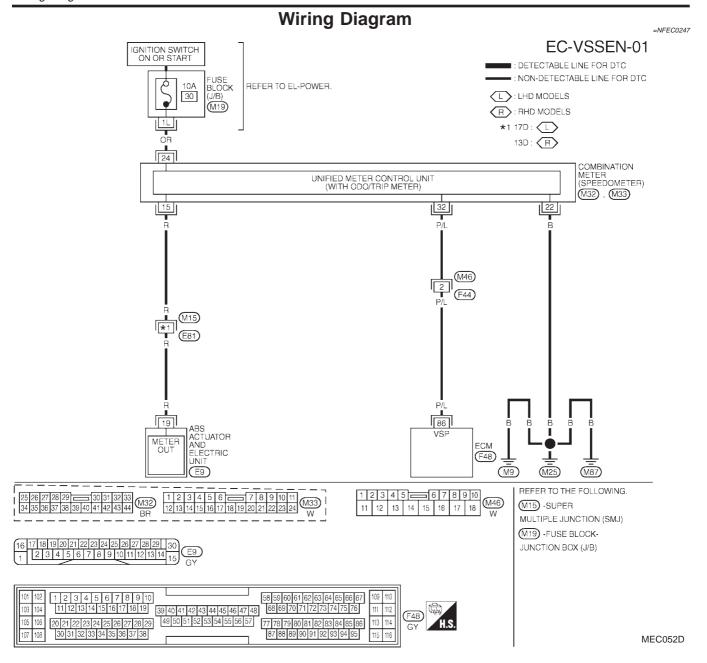
OK D	<b>&gt;</b>	GO TO 10.
NG		Replace EVAP canister purge volume control solenoid valve.

10	CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	<b>&gt;</b>	INSPECTION END



#### **Component Description**

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE

TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
86	D4		VEHICLE DRIVING AT 10 KM/H (6 MPH) IN 1ST GEAR POSITION UNDER LIFTED UP CONDITION	APPROX. 2.0V  (V) 10 5 0 100 ms
00	F/L		VEHICLE DRIVING AT 30 KM/H (19 MPH) IN 2ND GEAR POSITION UNDER LIFTED UP CONDITION	(V) 10 5 0

SEF859Y

#### **Diagnostic Procedure**

FEC0248

1	INSPECTION START		
Do yo	Do you have CONSULT-II?		
	Yes or No		
Yes	<b>&gt;</b>	GO TO 2.	
No	<b>•</b>	GO TO 3.	

#### 2 CHECK OVERALL FUNCTION

#### (P) With CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Lift up the vehicle.
- 3. Start engine and let it idle.
- 4. Select "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-II.
- 5. Check "VHCL SPEED SE" indication when rotating wheels with suitable gear position.

DATA MOI	NIT	OR
MONITOR		NO DTC
ENG SPEED	Х	XX rpm
COOLAN TEMP/S		XXX °C
B/FUEL SCHDL	X	XX msec
PW/ST SIGNAL		OFF
VHCL SPEED SE	X	XX km/h

"VHCL SPEED SE" indication should exceed 10 km/h (6 MPH).

SEF020Y

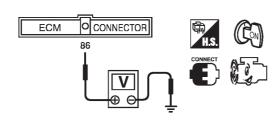
#### OK or NG

OK		INSPECTION END
NG	<b></b>	GO TO 4.

#### 3 CHECK OVERALL FUNCTION

#### Without CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Lift up the vehicle.
- 3. Start engine and let it idle.
- 4. Read the voltage signal between ECM terminal 86 and ground with an oscilloscope.
- 5. Verify that the oscilloscope screen shows a signal wave as shown below under the following conditions.



Conditions	Voltage
Vehicle speed is	(V)
30 km/h (19 MPH)	10
in 2nd gear	5
position.	0

SEF021Y

OK or NG

İ	OK •	INSPECTION END
	NG •	GO TO 4.

#### **VEHICLE SPEED SENSOR (VSS)**

#### Diagnostic Procedure (Cont'd)

NG

# CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT 1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 86 and combination meter terminal 32. Refer to Wiring Diagram. Continuity should exist. 4. Also check harness for short to ground and short to power. OK or NG OK

5	DETECT MALFUNCTIONING PART	
Check the following.  • Harness connectors M46, F44  • Harness for open or short between ECM and combination meter		
	•	Repair open circuit or short to ground or short to power in harness or connectors.

GO TO 5.

6	CHECK SPEEDOMETER FUNCTION		
Make sure that speedometer functions properly.			
	OK or NG		
OK	<b>&gt;</b>	GO TO 8.	
NG	<b>&gt;</b>	GO TO 7.	

7	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT		
Check the following.  • Harness connectors M15, E81  • Harness for open or short between combination meter and ABS actuator and electric unit			
	OK or NG		
ОК	OK Check combination meter and ABS actuator and electric unit. Refer to EL or BR section.		
NG	<b>&gt;</b>	Repair open circuit or short to ground or short to power in harness or connectors.	

8	CHECK INTERMITTENT INCIDENT		
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	► INSPECTION END		

Description

# Description SYSTEM DESCRIPTION

NFEC0249 NFEC0249S01

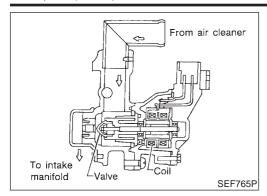
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Park/neutral position (PNP) switch	Park/neutral position		
Air conditioner switch	Air conditioner operation	Idle air control	IACV-AAC valve
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed	1	
Ambient air temperature switch	Ambient air temperature	1	
Intake air temperature sensor	Intake air temperature		
Absolute pressure sensor	Ambient barometic pressure		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).

#### NOTE:

Perform "Idle Air Volume Learning", EC-41, if engine idle speed is out of the specified value. Refer to SDS, EC-609.

Description (Cont'd)



# COMPONENT DESCRIPTION IACV-AAC Valve

NFEC0249S02

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in sequence. Each time the IACV-AAC valve opens or closes to change the auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

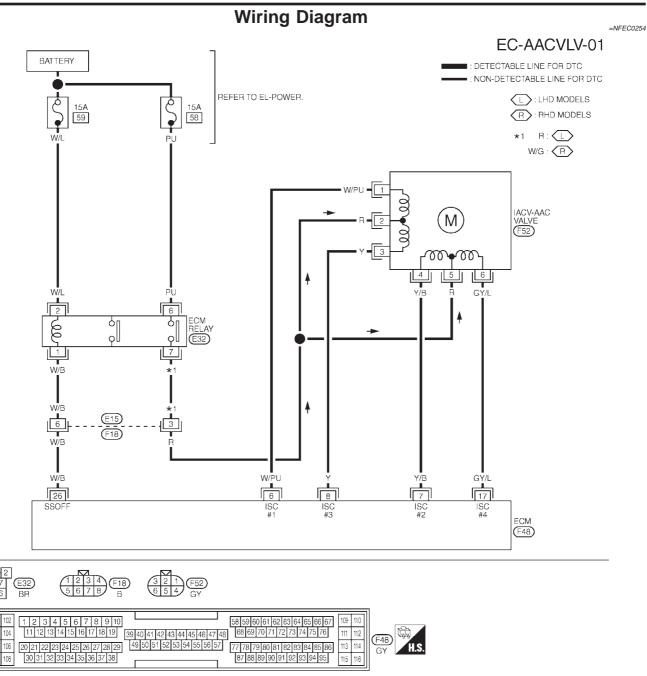
# **CONSULT-II** Reference Value in Data Monitor Mode

NFEC0250

Specification data are reference values.

MONITOR ITEM	COND	SPECIFICATION	
Engine: After warming up     Air conditioner switch: "OFF"     Shift lever: "N"     No-load		Idle	2 - 10 step
	2,000 rpm	_	

Wiring Diagram



MFC071D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
6	W/PU			
7	Y/B	IACV-AAC VALVE	ENGINE RUNNING AT IDLE SPEED	0.1 - 14V
8	Y	IACV-AAC VALVE	ENGINE ROMNING AT TOLE SPEED	0.1 - 140
17	GY/L			

SEF625XB

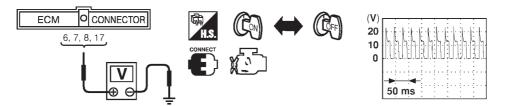
Diagnostic Procedure

#### **Diagnostic Procedure**

NFEC0255

#### 1 CHECK OVERALL FUNCTION

- 1. Turn ignition switch "OFF".
- 2. Read the voltage signal between ECM terminals 6, 7, 8, 17 (IACV-AAC valve signal) and ground with an oscilloscope.
- 3. Turn ignition switch "ON", wait at least 5 seconds and then "OFF".
- 4. Verify that the oscilloscope screen shows the signal wave as shown below at least once every 10 seconds after turning ignition switch "OFF".



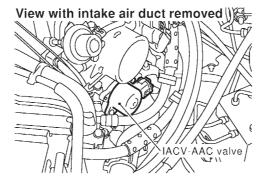
SEF022Y

#### OK or NG

OK •	INSPECTION END
NG ▶	GO TO 2.

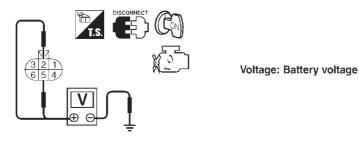
#### 2 CHECK IACV-AAC VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect IACV-AAC valve harness connector.



SEF269X

- 3. Turn ignition switch "ON".
- 4. Check voltage between IACV-AAC valve terminals 2, 5 and ground with CONSULT-II or tester.



SEF343X

OK or NG

OK •	GO TO 4.
NG ▶	GO TO 3.

Diagnostic Procedure (Cont'd)

#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness for open or short between IACV-AAC valve and ECM relay

Repair harness or connectors.

#### 4 CHECK IACV-AAC VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminals and IACV-AAC valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	IACV-AAC valve terminal
6	1
7	4
8	3
17	6

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#### Continuity should exist.

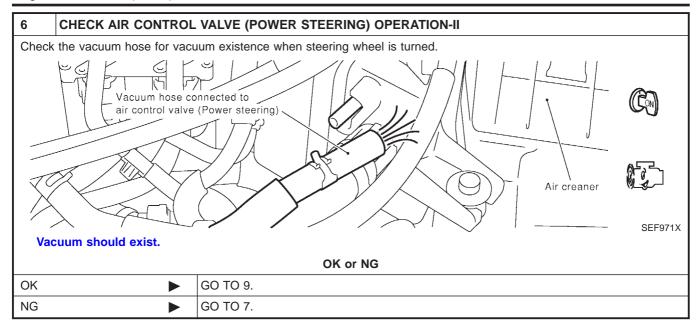
4. Also check harness for short to ground and short to power.

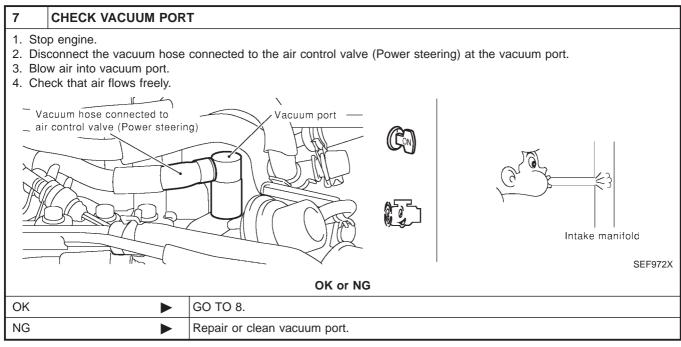
#### OK or NG

OK ▶	GO TO 5.
NG •	Repair open circuit or short to ground or short to power in harness or connectors.

#### 5 CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-I 1. Reconnect the ECM harness connector and IACV-AAC valve harness connector. 2. Disconnect the vacuum hose connected to the air control valve (Power steering) at the intake air duct. 3. Start engine and let it idle. 4. Check vacuum hose for vacuum existence. Vacuum hose connected to air control valve (Power steering) Air creaner SEF971X Vacuum slightly exists or does not exist. OK or NG OK GO TO 6. NG Replace air control valve (Power steering).

Diagnostic Procedure (Cont'd)





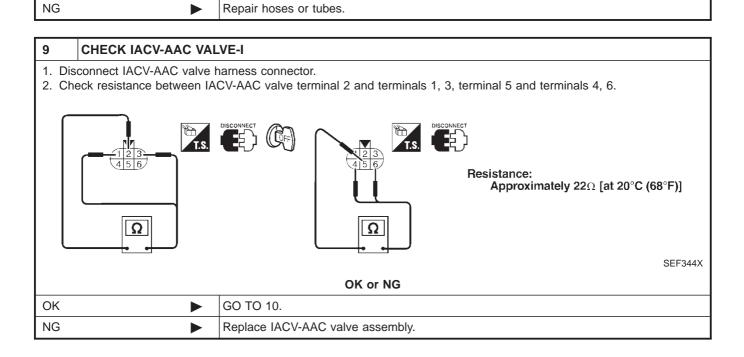
Diagnostic Procedure (Cont'd)

# 8 CHECK VACUUM HOSES AND TUBES 1. Disconnect vacuum hoses between the air control valve (Power steering) and vacuum port, air control valve (Power steering) and air duct. 2. Check hoses and tubes for cracks, clogging, improper connection or disconnection. Clogging Improper connection SEF109L

OK or NG

GO TO 9.

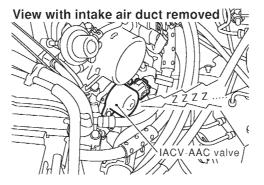
OK



Diagnostic Procedure (Cont'd)

#### 10 CHECK IACV-AAC VALVE-II

- 1. Reconnect IACV-AAC valve harness connector and ECM harness connector.
- 2. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve makes operating sound according to the ignition switch position.



SEF589X

#### OK or NG

OK		GO TO 12.
NG	<b>•</b>	GO TO 11.

#### 11 REPLACE IACV-AAC VALVE

- 1. Replace IACV-AAC valve assembly.
- 2. Perform "Idle Air Volume Learning", EC-41.

Which is the result CMPLT or INCMP?

#### **CMPLT or INCMP**

CMPLT -	INSPECTION END
INCMP -	Follow the construction of "Idle Air Volume Learning".

#### 12 CHECK TARGET IDLE SPEED

- 1. Turn ignition switch "OFF".
- 2. Reconnect all harness connectors and vacuum hoses.
- 3. Start engine and warm it up to normal operating temperature.
- 4. Also warm up transmission to normal operating temperature.
- For A/T models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
- For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.
- 5. Stop vehicle with engine running.
- 6. Check target idle speed.

M/T: 625±50 rpm (VQ30DE engine models)

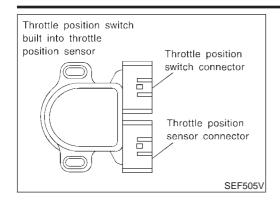
M/T: 675±50 rpm (VQ20DE engine models)

A/T: 700±50 rpm (in "P" or "N" position)

#### OK or NG

OK •	GO TO 13.
NG ►	Perform "Idle Air Volume Learning", EC-41.

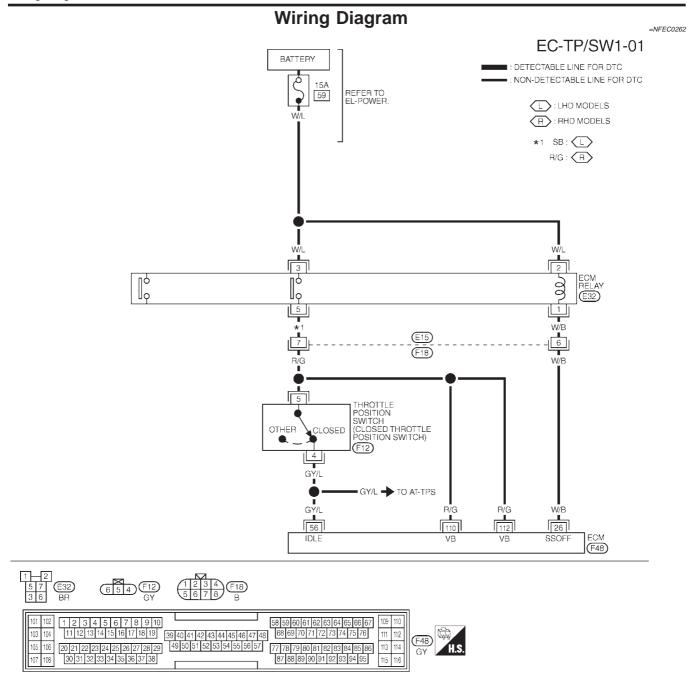
# 13 CHECK INTERMITTENT INCIDENT Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131. INSPECTION END



#### **Component Description**

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.

When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.



MFC072D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.
CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	R/G		ENGINE RUNNING WITH ACCELERATOR PEDAL FULLY RELEASED UNDER WARM-UP CONDITION	BATTERY VOLTAGE
3		(CLOCED DOCITION)	IGN ON WITH ACCELERATOR PEDAL DEPRESSED	APPROX. 0V

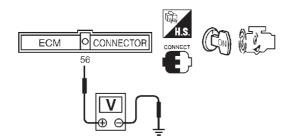
SEF626XC

#### **Diagnostic Procedure**

NFEC0263

#### 1 CHECK OVERALL FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM terminal 56 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal is fully released.	Battery voltage
Accelerator pedal is depressed.	Approximately 0V

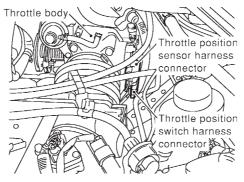
SEF023Y

OK or NG

OK •	INSPECTION END
NG ►	GO TO 2.

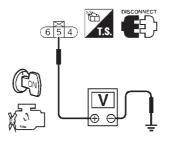
#### 2 CHECK CLOSED THROTTLE POSITION SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect throttle position switch harness connector.



SEF260X

- 3. Turn ignition switch "ON".
- 4. Check voltage between throttle position switch terminal 5 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF346X

OK or NG

OK •	GO TO 4.
NG ▶	GO TO 3.

#### **CLOSED THROTTLE POSITION SWITCH**

Diagnostic Procedure (Cont'd)

#### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness for open or short between throttle position switch and ECM relay
- Harness for open or short between throttle position switch and ECM

Repair harness or connectors.

#### 4 CHECK CLOSED THROTTLE POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 56 and throttle position switch terminal 4. Refer to Wiring Diagram.

#### Continuity should exist.

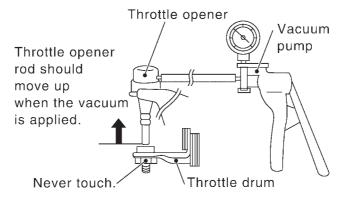
4. Also check harness for short to ground and short to power.

#### OK or NG

OK •	GO TO 5.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

#### 5 CHECK THROTTLE POSITION SWITCH

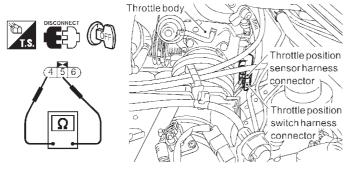
- 1. Reconnect ECM harness connector and throttle position switch harness connector.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch "OFF".
- 4. Remove vacuum hose connected to throttle opener.
- 5. Connect suitable vacuum hose to vacuum pump and the throttle opener.
- 6. Apply vacuum [more than -40.0 kPa (-400 mbar, -300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



7. Disconnect closed throttle position switch harness connector.

SEF793W

8. Check continuity between closed throttle position switch terminals 4 and 5 under the following conditions. Resistance measurement must be made with throttle position switch installed in vehicle.



Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

SEF347X

OK c	or N	G
------	------	---

OK •	GO TO 7.
NG ▶	GO TO 6.

#### **CLOSED THROTTLE POSITION SWITCH**

Diagnostic Procedure (Cont'd)

6	ADJUST THROTTLE POSITION SWITCH				
Check the following items. Refer to "Basic Inspection", EC-92.					
		Items	Specifications		
		Ignition timing	9° ± 5° BTDC (VQ20DE engine) 15° ± 5° BTDC (VQ30DE engine)		
		Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF		
		Target idle speed	M/T: 625 ± 50 rpm (VQ30DE engine) 675 ± 50 rpm (VQ20DE engine) A/T: 700 ± 50 rpm (in "P" or "N" position)		
ls it p	oossible to adjust closed	throttle position swite	ch?	MTBL0623	
	Yes or No				
Yes	<b>&gt;</b>	GO TO 1.			
No	<b>•</b>	Replace throttle positi	ion switch.		

7	CHECK INTERMITTENT INCIDENT			
Refer	efer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	► INSPECTION END			

#### A/T COMMUNICATION LINE

#### System Description

#### **System Description**

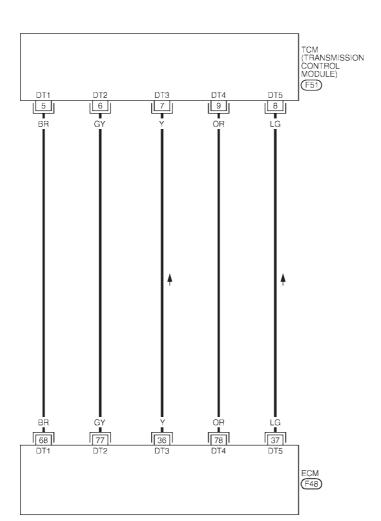
These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/

Voltage signals are exchanged between ECM and TCM (Transmission Control Module).

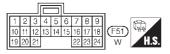
#### **Wiring Diagram**

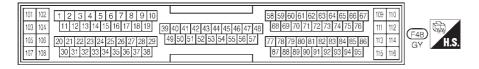
=NFEC0269

#### EC-ATCONT-01









MEC073D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

10 1112 201	TO THE EDING THAT GOETH GOETH GROOMS OTHER THAT EDIN TERMINATES, GOOTH TO THE GROOMS.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)		
36 37 68 77 78	Y LG BR GY OR	A/T COMMUNICATION LINE	ENGINE RUNNING AT IDLE SPEED	VOLTAGE FLUCTUATES BETWEEN 0 to 5V.		

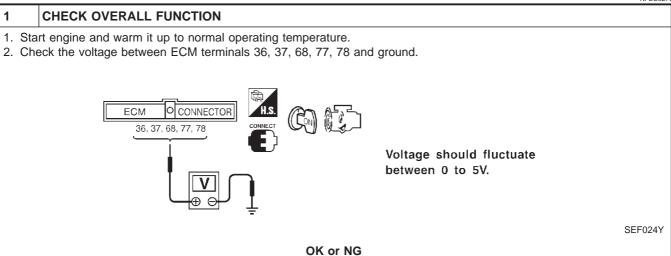
SEF043YA

OK

NG

#### **Diagnostic Procedure**

NFEC0270



INSPECTION END

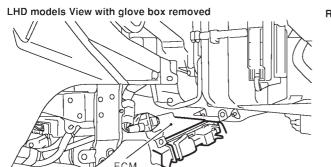
GO TO 2.

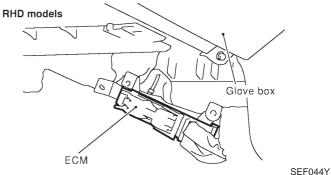
EC-534

#### A/T COMMUNICATION LINE

#### 2 CHECK A/T CONTROL INPUT SIGNAL CIRCUIT FOR OPEN

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.





View with center console removed

SEF271X

3. Check harness continuity between the following terminals.

ECM	TCM
68	5
77	6
36	7
78	9
37	8

MTBL0405

Refer to Wiring Diagram.

Continuity should exist.

#### OK or NG

OK	GO TO 3.
NG	Repair harness or connectors.

#### 3 CHECK A/T CONTROL INPUT SIGNAL CIRCUIT FOR SHORT

1. Check harness continuity between ECM terminals 36, 37, 68, 77, 78 and ground. Refer to Wiring Diagram.

Continuity should not exist.

2. Also check harness for short to power.

#### OK or NG

OK •	GO TO 4.
NG ▶	Repair short to ground or short to power in harness or connectos.

#### 4 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.

**▶** INSPECTION END

# **Description SYSTEM DESCRIPTION**

NFEC0523 NFEC0523S01

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position		
Ignition switch	Start signal		Swirl control valve control
Crankshaft position sensor (POS)	Engine speed (POS signal)		solenoid valve  ↓ Vacuum signal
Crankshaft position sensor (REF)	Engine speed (REF signal)	valve control	Swirl control valve actuator
Mass air flow sensor	Amount of intake air		Swirl control valve
Engine coolant temperature sensor	Engine coolant temperature		

This system has a swirl control valve in the intake passage of each cylinder.

While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

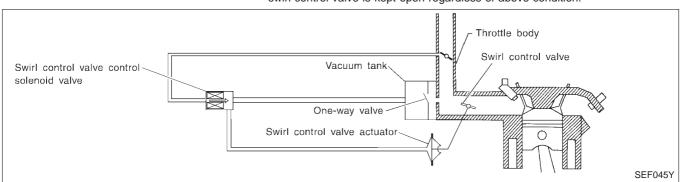
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

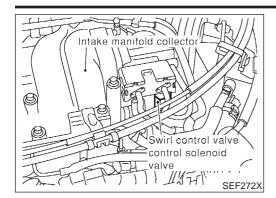
Throttle position sensor (Idle position)  Engine speed		Swirl control valve control solenoid valve	Swirl control valve
ON Below 3,200 rpm		ON	Closed
OFF	Less than 3,200 rpm	ON	Closed
	More than 3,600 rpm	OFF	Open

When engine coolant temperature is below 10°C (50°F) and above 55°C (131°F), swirl control valve is kept open regardless of above condition.



#### SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

Description (Cont'd)



#### COMPONENT DESCRIPTION

#### **Swirl Control Valve Control Solenoid Valve**

NFEC0523S02

NFEC0523S0201

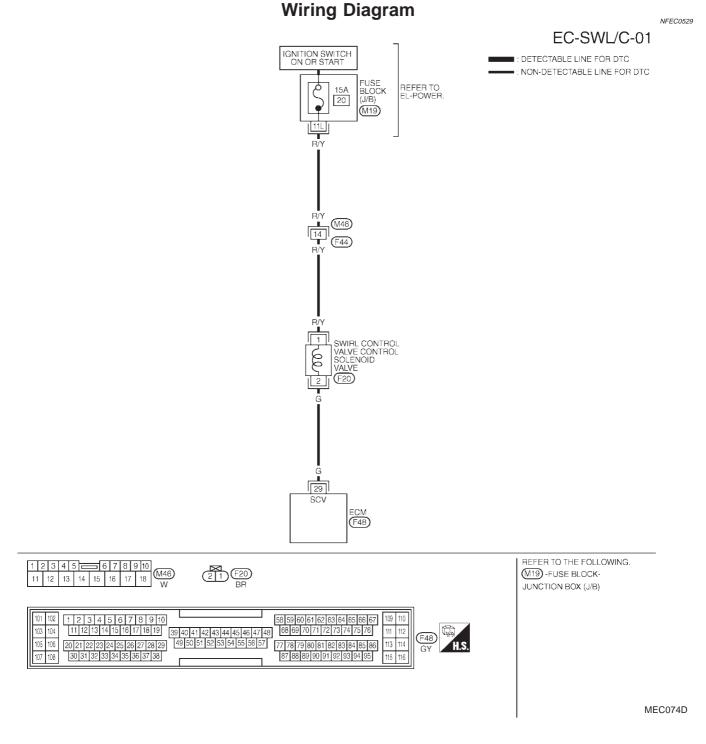
The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

#### **CONSULT-II Reference Value in Data Monitor** Mode

Specification data are reference values.

NFEC0524

MONITOR ITEM	CONDITION		SPECIFICATION	
SWRL CONT S/V	Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON	
	ŭ i	Engine coolant temperature is above 55°C (131°F).	OFF	



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

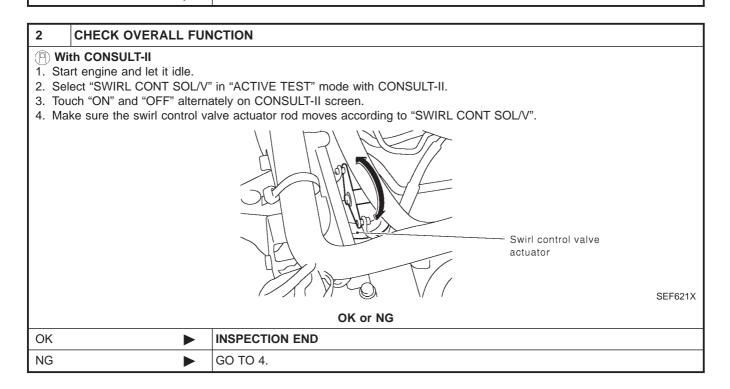
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
29	6		ENGINE RUNNING AT IDLE SPEED WITH ENGINE COOLANT TEMPERATURE BETWEEN 15°C (59°F) AND 50°C (122°F).	0 - 1V
29	G		ENGINE DUNNING AT IDLE SPEED WITH	BATTERY VOLTAGE

SEF627XB

#### SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

Diagnostic Procedure

Diagnostic Procedure				
1	INSPECTION START			
Do yo	Do you have CONSULT-II?			
	Yes or No			
Yes	<b>&gt;</b>	GO TO 2.		
No	<b>•</b>	GO TO 3.		



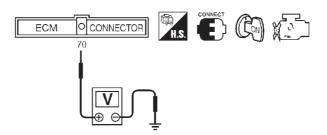
#### SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

Diagnostic Procedure (Cont'd)

#### 3 CHECK OVERALL FUNCTION

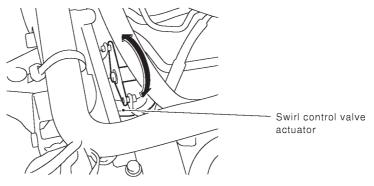
#### Without CONSULT-II

- 1. Turn ignition switch "ON".
- 2. Confirm that the voltage between ECM terminal 70 (Engine coolant temperature sensor signal) and ground is more than 2.72V. If the voltage is out of range, cool the engine down.



SEF016Y

- 3. Start engine and let it idle.
- 4. Make sure the swirl control valve actuator rod moves when revving to over 3,200 rpm from idle.



OK or NG

SEF621X

OK	<b>•</b>	INSPECTION END

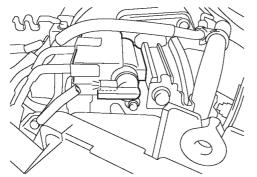
NG GO TO 5.

Diagnostic Procedure (Cont'd)

### CHECK VACUUM SOURCE

### (P) With CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Disconnect the vacuum hose connected to the swirl control valve actuator at vacuum tank.
- 3. Start engine and let it idle.
- 4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Touch "ON" and "OFF" alternately on CONSULT-II screen.
- 6. Check vacuum existence under the following conditions.



SWIRL CONT SOL/V	Vacuum
ON	Should exist.
OFF	Should not exist.





SEF026Y

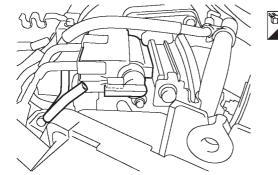
OK (	or N	G
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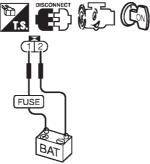
OK •	GO TO 6.
NG ▶	GO TO 7.

### 5 CHECK VACUUM SOURCE

### Without CONSULT-II

- 1. Turn ignition switch "OFF".
- 2. Disconnect the swirl control valve control solenoid valve harness connector.
- 3. Disconnect the vacuum hose connected to the swirl control valve actuator at vacuum tank.
- 4. Start engine and let it idle.
- 5. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
- 6. Check vacuum existence under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

SEF027Y

OK or NG

OK	GO TO 6.
NG ►	GO TO 8.

Diagnostic Procedure (Cont'd)

### **CHECK VACUUM HOSES AND TUBES** 1. Turn ignition switch "OFF". 2. Remove vacuum hoses between the swirl control valve actuator and the vacuum tank. 3. Check hoses and tubes for cracks, clogging, improper connection or disconnection. Clogging Improper connection SEF109L OK or NG OK Repair or replace swirl control valve actuator. NG Repair or replace vacuum hoses or tubes.

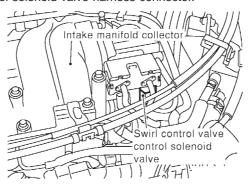
7 CHECK	SWIRL CONTR	OL VALVE CO	NTROL SOLEN	OID VA	LVE CIRCUIT	
(P) With CONS	ULT-II					
1. Turn ignition	switch "ON".					
2. Select "SWIF	RL CONT SOL/V"	in "ACTIVE TES	ST" mode with Co	ONSULT	Γ-II.	
3. Touch "ON"	and "OFF" alterna	ately on CONSU	LT-II screen.			
			ACTIVE TES	Т		
			SWIRL CONT SOL/V	OFF		
			MONITOR			
			ENG SPEED	XXX rpm		
			IACV-AAC/V	XXX step		
					-	
					l	SEF069Y
4. Make sure th	nat clicking sound	is heard from the	he swirl control va	alve con	trol solenoid valve.	
			OK or NO	}		
OK	<b>•</b>	GO TO 11.				
NG	<b>•</b>	GO TO 8				

OK •	GO TO 11.
NG ►	GO TO 8.

Diagnostic Procedure (Cont'd)

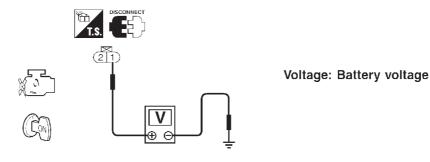
### CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect swirl control valve control solenoid valve harness connector.



SEF272X

- 3. Turn ignition switch "ON".
- 4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



SEF619X

OK or NG

OK ►	GO TO 10.
NG ►	GO TO 9.

### DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- 15A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse
  - Repair harness or connectors.

### 10 CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 29 and swirl control valve control solenoid valve terminal 2. Refer to Wiring Diagram.

### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK	or	NG

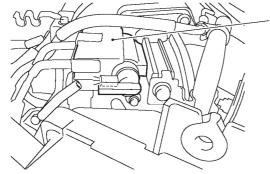
OK •	GO TO 11.
NG ▶	Repair open circuit, short to ground or short to power in harness connectors.

Diagnostic Procedure (Cont'd)

### 1 CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

### (P) With CONSULT-II

- 1. Reconnect the disconnected harness connectors.
- 2. Start engine and let it idle.
- 3. Remove vacuum hose connected to swirl control valve actuator.
- 4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
- 5. Touch "ON" and "OFF" on CONSULT-II screen.
- 6. Check vacuum existence and operation delay time under the following conditions.



Swirl control valve control solenoid valve

SWIRL CONT SOL/V	Vacuum
ON	should exist.
OFF	should not exist.

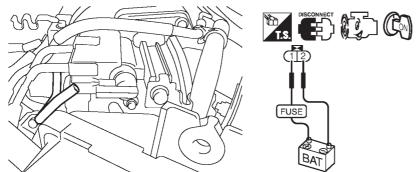
Operation takes less than 1 second.



SEF046Y

### Without CONSULT-II

- 1. Reconnect ECM harness connector.
- 2. Remove vacuum hose connected to swirl control valve actuator.
- 3. Start engine and let it idle.
- 4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
- 5. Check vacuum existence and operation delay time under the following conditions.



Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

SEF047Y

OK •	GO TO 12.
NG ►	Replace intake manifold collector assembly.

OK or NG

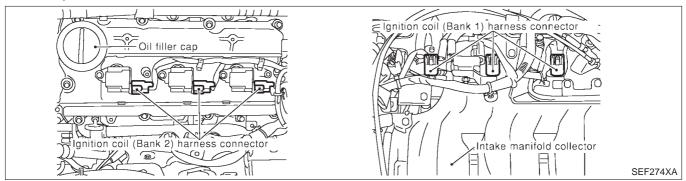
### 12 CHECK INTERMITTENT INCIDENT Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131. INSPECTION END

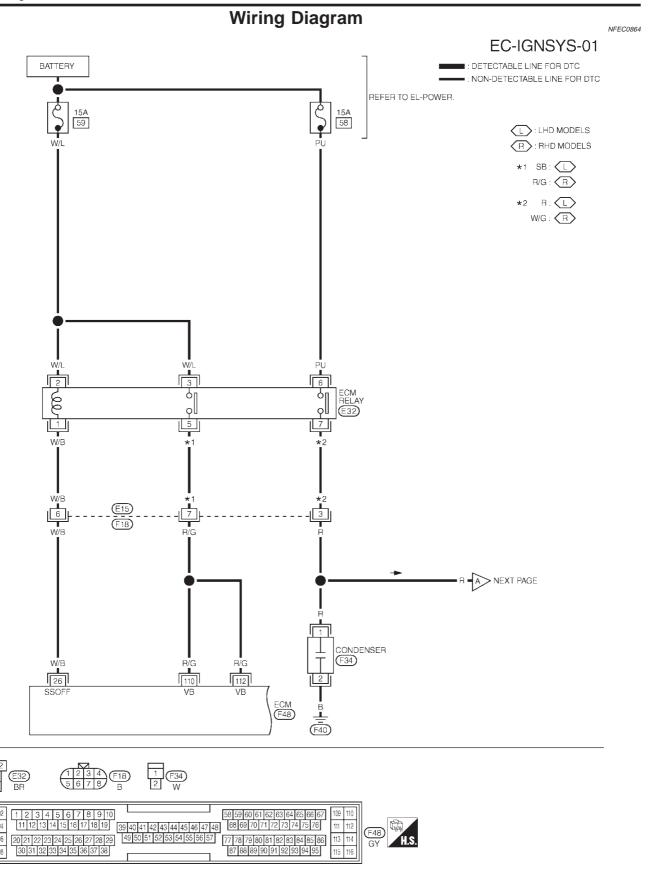
### **Component Description**

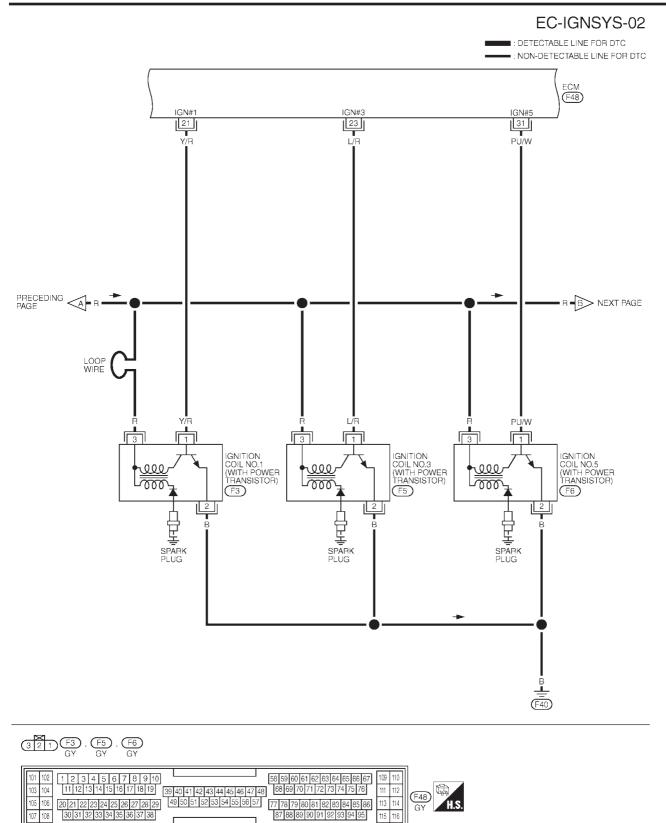
### **IGNITION COIL & POWER TRANSISTOR**

NFEC0863

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

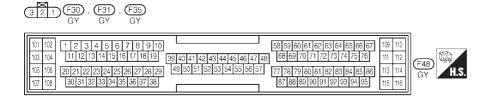






MEC076D

### EC-IGNSYS-03 : DETECTABLE LINE FOR DTC -: NON-DETECTABLE LINE FOR DTC ECM (F48) IGN#6 32 GY/R IGN#2 22 30 G/R PRECEDING BR IGNITION COIL NO.4 (WITH POWER TRANSISTOR) IGNITION COIL NO.2 (WITH POWER TRANSISTOR) IGNITION COIL NO.6 (WITH POWER TRANSISTOR) عع<u>ب</u> reee ىلل مس (F31) (F30) 青 SPARK PLUG SPÄRK PLUG



MEC077D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN THE ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
21 22 23	Y/R G/R L/R	IGNITION SIGNAL NO. 1 IGNITION SIGNAL NO. 2 IGNITION SIGNAL NO. 3	ENGINE RUNNING AT IDLE SPEED UNDER THE WARM UP CONDITION	(V) 4 2 0 100 ms
30 31 32	GY PU/W GY/R	IGNITION SIGNAL NO. 4 IGNITION SIGNAL NO. 5 IGNITION SIGNAL NO. 6	ENGINE RUNNING AT 2,500 RPM	0 - 0.2V ★  (V) 4 2 0 100 ms

★: AVERAGE VOLTAGE FOR PULSE SIGNAL (ACUTUAL PULSE SIGNAL CAN BE CONFIRMED BY OSCILLOSCOPE.)

SEF860Y

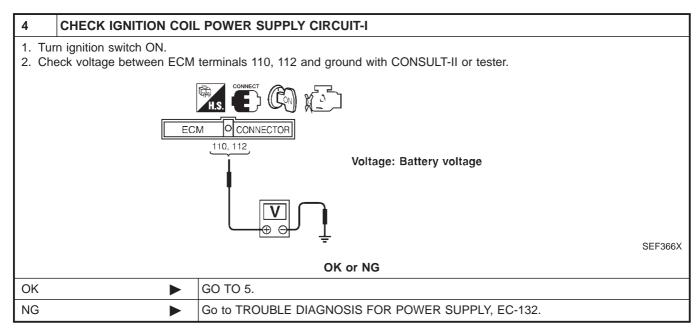
### **Diagnostic Procedure**

NFEC0865

**INSPECTION START** Turn ignition switch "OFF", and restart engine. Is engine running? Yes or No Yes (With CONSULT-II) GO TO 2. Yes (Without CONSULT-GO TO 3. II) No GO TO 4.

### 2 **CHECK OVERALL FUNCTION** With CONSULT-II 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II. 2. Make sure that all circuits do not produce a momentary engine speed drop. ACTIVE TEST POWER BALANCE MONITOR **ENG SPEED** XXX rpm MAS AIF SE-B1 IACV-AAC/V XXX step SEF070Y OK or NG OK **INSPECTION END** NG GO TO 13.

### **CHECK OVERALL FUNCTION** Without CONSULT-II 1. Let engine idle. 2. Read the voltage signal between ECM terminals 21, 22, 23, 30, 31, 32 and ground with an oscilloscope. 3. Verify that the oscilloscope screen shows the signal wave as shown below. (V) ECM 21, 22, 23, 30, 31, 32 100 ms SEF071Y OK or NG OK **INSPECTION END** NG GO TO 13.



## 5 CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II 1. Turn ignition switch OFF. 2. Disconnect condenser harness connector. SEF275X 3. Turn ignition switch ON. 4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester. Voltage: Battery voltage

OK or NG

### 6 CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

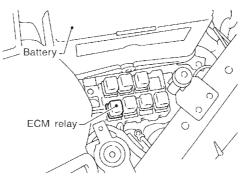
GO TO 11.

GO TO 6.

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM relay.

OK

NG



SEF589PB

- 3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1. Refer to Wiring Diagram.

  Continuity should exist.
- 4. Also check harness for short to ground and short to power.

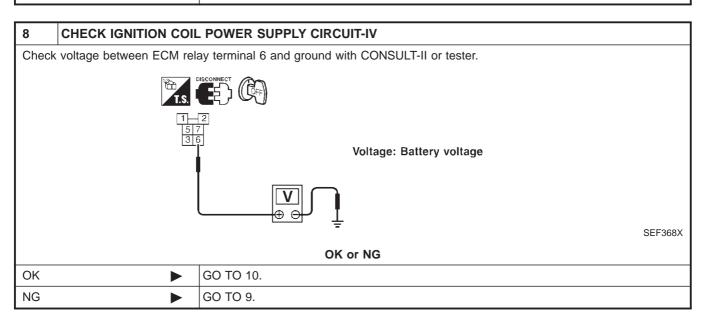
OK •	GO TO 8.
NG ►	GO TO 7.

### 7 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F18, E15
- Harness for open or short between ECM relay and condenser

Repair open circuit or short to ground or short to power in harness or connectors.



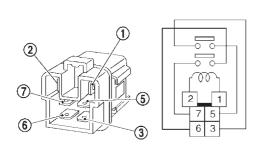
### 9 DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open and short between ECM relay and fuse
  - ► Repair or replace harness or connectors.

### 10 CHECK ECM RELAY

- 1. Apply 12V direct current between ECM relay terminals 1 and 2.
- 2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.



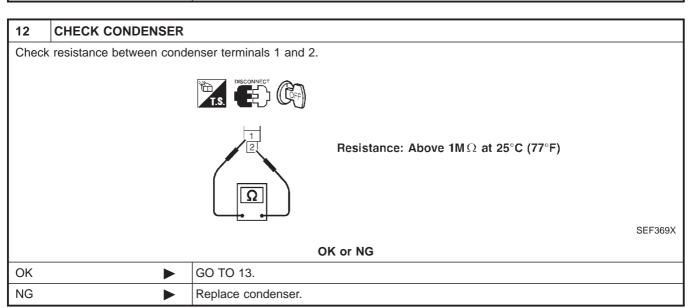
Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

SEF296X

OK	or	NG
UN	OI.	ING

OK ►	GO TO 18.
NG ▶	Replace ECM relay.

11	CHECK CONDENSER	GROUND CIRCUIT FOR OPEN AND SHORT	
2. Ch	Turn ignition switch OFF.     Check harness continuity between condenser terminal 2 and engine ground. Refer to Wiring Diagram.     Continuity should exist.     Also check harness for short to ground and short to power.		
	OK or NG		
OK	<b>&gt;</b>	GO TO 12.	
NG	<b>&gt;</b>	Repair open circuit or short to ground or short to power in harness or connectors.	



NG

### 13 **CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V** 1. Turn ignition switch OFF. 2. Reconnect harness connectors disconnected. 3. Disconnect ignition coil harness connector. Elgnition coil (Bank 1) harness connector . Oil filler cap Ignition coil (Bank 2) harness connector Intake manifold collector 9 SEF274XA 4. Turn ignition switch ON. 5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester. Voltage: Battery voltage SEF370X OK or NG OK GO TO 15.

14	4 DETECT MALFUNCTIONING PART		
Check	Check the harness for open or short between ignition coil and harness connector F18.		
	Repair or replace harness or connectors.		

GO TO 14.

15	CHECK IGNITION COIL	GROUND CIRCUIT FOR OPEN AND SHORT	
2. Che	Turn ignition switch OFF.     Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.     Continuity should exist.     Also check harness for short to ground and short to power.		
	OK or NG		
OK	<b>&gt;</b>	GO TO 16.	
NG	<b>&gt;</b>	Repair open circuit or short to ground or short to power in harness or connectors.	

### 16 CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminals 21, 22, 23, 30, 31, 32 and ignition coil terminal 1. Refer to Wiring Diagram.

### Continuity should exist.

NG

3. Also check harness for short to ground and short to power.

### OK or NG

OK •	GO TO 17.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

### Terminals Resistance Result 2 and 3 Terminals Resistance Result 2 and 3 Not 0Ω NG OK or NG OK GO TO 18.

18	18 CHECK INTERMITTENT INCIDENT	
Refer	fer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
► INSPECTION END		INSPECTION END

Replace ignition coil with power transistor.

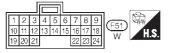
### A/T DIAGNOSIS COMMUNICATION LINE

### Component Description

### **Component Description**

The malfunction information related to A/T (Automatic Transmission) is transferred through the line (circuit) from TCM (Transmission control module) to ECM.

# Wiring Diagram EC-ATDG1-01 TCM (TRANSMISSION CONTROL MODULE) (BD2 (FS) BRW ECM FAB EC-ATDG1-01 ECCONTROL MODULE) FOR DTC FOR DT





MEC078D

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
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ı	TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
	60	BR/W	A/T DIAGNOSIS COMMUNICATION LINE		VOLTAGE FLUCTUATES BETWEEN 0 to 2V.

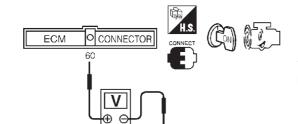
SEF048YA

### **Diagnostic Procedure**

NFEC0366

### 1 CHECK OVERALL FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check the voltage between ECM terminal 60 and ground.



Voltage should fluctuate between 0 - 2V.

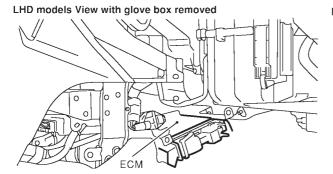
SEF025Y

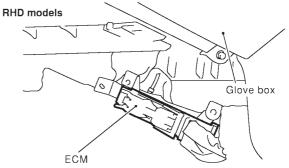
OK or NG

OK •	•	INSPECTION END
NG	•	GO TO 2.

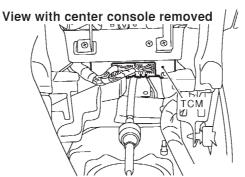
### 2 CHECK A/T DIAGNOSIS COMMUNICATION LINE INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.





SEF044Y



SEF271X

- 3. Check harness continuity between ECM terminal 60 and TCM terminal 15. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

### OK or NG

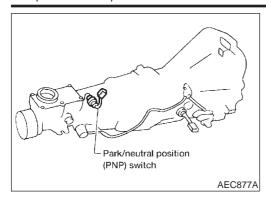
OK ►	GO TO 3.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

### A/T DIAGNOSIS COMMUNICATION LINE

Diagnostic Procedure (Cont'd)

3	3 CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
► INSPECTION END		INSPECTION END	

### Component Description



### **Component Description**

NEEC0367

When the gear position is "P" (A/T models only) or "N", park/neutral position (PNP) switch is "ON".

ECM detects the position because the continuity of the line (the "ON" signal) exists.

For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

### **CONSULT-II Reference Value in Data Monitor Mode**

NFEC0368

Specification data are reference values.

MONITOR ITEM	CONE	DITION	SPECIFICATION
P/N POSI SW	Ignition switch: ON	Shift lever: "P" or "N" (A/T models) Neutral (M/T models)	ON
		Except above	OFF

### **Wiring Diagram** NFEC0373 EC-PNPSW1-01 : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC (F48) NEUT A: WITH A/T 44 M: WITH M/T G/OR G/W Α G/OR PARK/NEUTRAL POSITION SWITCH OTHERS PARK/NEUTRAL POSITION SWITCH NEUTRAL . (F13): (M) (F152): (A) (F151) (F41) (F39) 1 2 3 4 5 6 7 8 9 10 58 59 60 61 62 63 64 65 66 67

(F48)

113 114

MEC053D

11 12 13 14 15 16 17 18 19

20 21 22 23 24 25 26 27 28 29

30 31 32 33 34 35 36 37 38

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

68 69 70 71 72 73 74 75 76

77 78 79 80 81 82 83 84 85 86

87 88 89 90 91 92 93 94 95

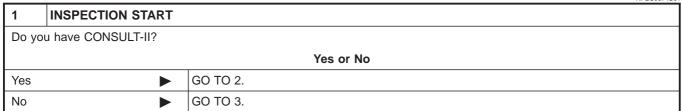
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
44	G/OR (A/T) G/W (M/T) PARK/NEUTRAL POSITION (PNP) SWITCH		IGN ON WITH GEAR POSITION "N" OR "P"(A/T), GEAR POSITION NEUTRAL (M/T)	APPROX. 0V
44		IGN ON WITHOUT THE ABOVE GEAR POSITION	BATTERY VOLTAGE	

SEF635XC

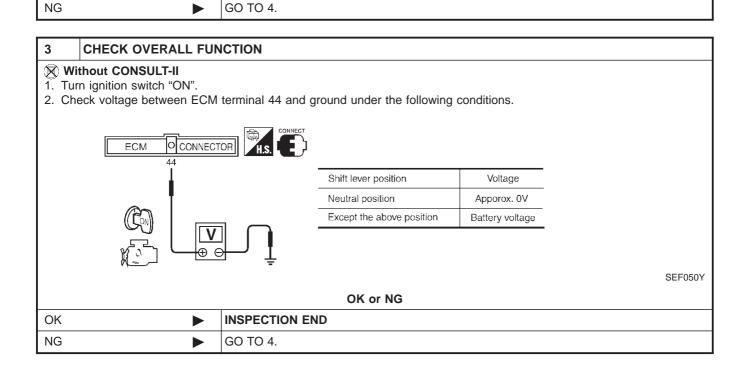
### Diagnostic Procedure FOR M/T MODELS

NFEC0374

NFEC0374S01



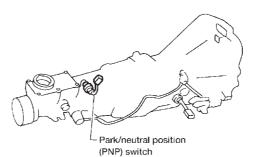
### 2 **CHECK OVERALL FUNCTION** With CONSULT-II 1. Turn ignition switch "ON". 2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II. 3. Check the "P/N POSI SW" signal under the following conditions. DATA MONITOR MONITOR NO DTC P/N POSI SW P/N POSI SW Shift lever position ON Neutral position Except the above position OFF SEF049Y OK or NG OK **INSPECTION END**



Diagnostic Procedure (Cont'd)

### 4 CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect park/neutral position (PNP) switch harness connector.



AEC877A

- 3. Check harness continuity between PNP switch terminal 4 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

OK or NG

OK I	<b></b>	GO TO 5.
NG		Repair open circuit or short to ground or short to power in harness or connectors.

### 5 CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 44 and PNP switch terminal 3. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

OK or NG

OK ►	GO TO 6.
NG ►	Repair open circuit or short to ground or short to power in harness or connectors.

6	6 CHECK PARK/NEUTRAL POSITION (PNP) SWITCH		
Refer	Refer to MT-9, "Position Switch Check".		
	OK or NG		
OK	OK ▶ GO TO 7.		
NG	NG Replace park/neutral position (PNP) switch.		

7	7 CHECK INTERMITTENT INCIDENT	
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
	► INSPECTION END	

Diagnostic Procedure (Cont'd)

### FOR A/T MODELS

-NFEC0374S0

		=NFEC037-	<i>4S02</i>
1	INSPECTION START		
Do yo	u have CONSULT-II?		$\neg$
	Yes or No		
Yes	•	TO 2.	
No	<b></b>	TO 3.	7

### 2 CHECK OVERALL FUNCTION

### With CONSULT-II

- 1. Turn ignition switch "ON".
- 2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
- 3. Check the "P/N POSI SW" signal under the following conditions.

DATA MONITOR				
MONITOR	NO DTC			
P/N POSI SW	ON			

Selector lever position	P/N POSI SW
"N" and "P" position	ON
Except the above position	OFF

SEF028Y

### OK or NG

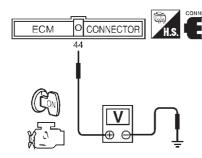
OK ►	INSPECTION END
NG ►	GO TO 4.

### 3 CHECK OVERALL FUNCTION

### Without CONSULT-II

1. Turn ignition switch "ON".

2. Check voltage between ECM terminal 44 and ground under the following conditions.



Selector lever position	Voltage
"P" and "N" position	Apporox. 0V
Except the above position	Battery voltage

SEF029Y

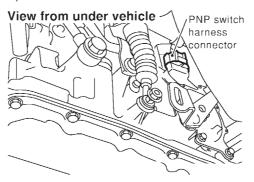
OK or NG

OK •	INSPECTION END
NG ►	GO TO 4.

Diagnostic Procedure (Cont'd)

### 4 CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect park/neutral position (PNP) switch harness connector.



SEF279X

- 3. Check harness continuity between PNP switch terminal 2 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 4. Also check harness for short to ground and short to power.

### OK or NG

OK	GO TO 6.
NG	GO TO 5.

### 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F10, F151
- Harness for open or short between park/neutral position (PNP) switch and engine ground

Repair open circuit or short to ground or short to power in harness or connectors.

### 6 CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 44 and PNP switch terminal 1. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

### OK or NG

OK	<b>&gt;</b>	GO TO 8.
NG	•	GO TO 7.

### 7 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F10, F151
- Harness for open or short between ECM and park/neutral position (PNP) switch
  - Repair open circuit or short to ground or short to power in harness or connectors.

### 8 CHECK PARK/NEUTRAL POSITION (PNP) SWITCH Refer to AT-127, "Diagnostic Procedure". OK or NG OK Replace park/neutral position (PNP) switch.

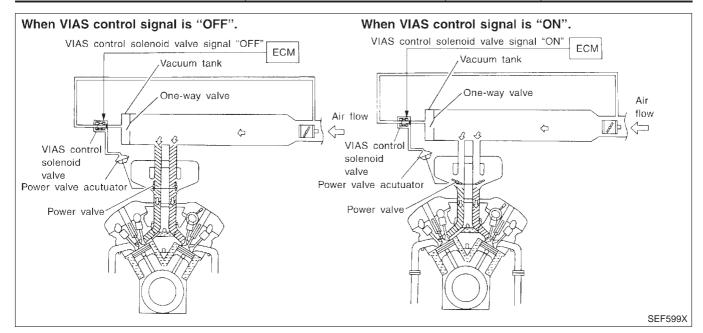
Diagnostic Procedure (Cont'd)

9	CHECK INTERMITTENT	INCIDENT
Refer to "TROUBLE DIGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	<b>•</b>	INSPECTION END

### Description SYSTEM DESCRIPTION

NFEC0596S01

Sensor	Input Signal to ECM	ECM function	Actuator
Mass air flow sensor	Amount of intake air		
Throttle position sensor	Throttle position		
Closed throttle position	Throttle valve idle position		
Ignition switch	Start signal	VIAS control	VIAS control solenoid valve
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Engine coolant temperature sensor	Engine coolant temperature		

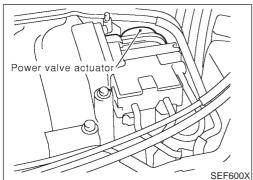


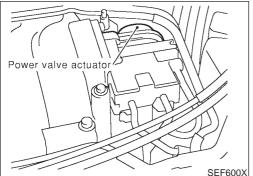
When the engine is running at low or medium speed, the power valve is fully closed. Under this condition, the effective suction port length is equivalent to the total length of the intake manifold collector's suction port including the intake valve. This long suction port provides increased air intake which results in improved suction efficiency and higher torque generation.

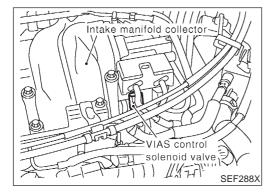
The surge tank and one-way valve are provided. When engine is running at high speed, the ECM sends the signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore opens the power valve to two suction passages together in the collector.

Under this condition, the effective port length is equivalent to the length of the suction port provided independently for each cylinder. This shortened port length results in enhanced engine output with reduced suction resistance under high speeds.

### Description (Cont'd)







### **COMPONENT DESCRIPTION**

### **Power Valve**

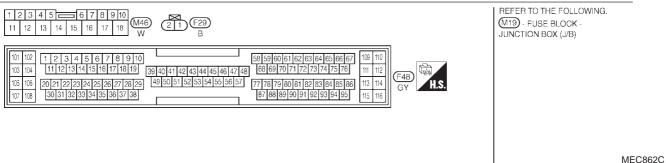
NFEC0596S02

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.

### **VIAS Control Solenoid Valve**

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.

### **Wiring Diagram** NFEC0597 EC-VIAS/V-01 IGNITION SWITCH ON OR START : DETECTABLE LINE FOR DTC -: NON-DETECTABLE LINE FOR DTC FUSE BLOCK (J/B) (M19) 15A 20 REFER TO EL-POWER. (M46) (F44) VIAS CONTROL SOLENOID VALVE 16 VIAS ECM F48 REFER TO THE FOLLOWING.



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
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TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
16	Y/G		ENGINE RUNNING AT IDLE SPEED	BATTERY VOLTAGE
10	170	VALVE	ENGINE RUNNING ABOVE 5,000 RPM	0 - 1.0V

SEF636XB

Diagnostic Procedure

### **Diagnostic Procedure**

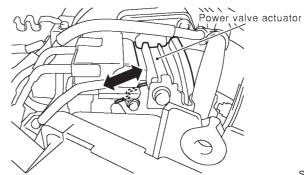
NFEC0598

### 1 CHECK OVERALL FUNCTION

### (P) With CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Perform "VIAS SOL VALVE" in "ACTIVE TEST" mode with CONSULT-II.
- 3. Turn VIAS control solenoid valve "ON" and "OFF", and make sure that power valve actuator rod moves.

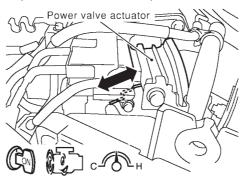
ACTIVE TEST			
VIAS SOL VALVE	OFF		
MONITOR	3		
ENG SPEED	XXX rpm		
IACV-AAC/V	XXX step		



SEC236C

### Without CONSULT-II

- 1. Start engine and warm it up to normal operating temperature.
- 2. Rev engine quickly up to above 5,000 rpm and make sure that power valve actuator rod moves.



SEF052Y

OK or NG

OK ▶	INSPECTION END
NG ▶	GO TO 2.

Diagnostic Procedure (Cont'd)

# 2 CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT 1. Stop engine. 2. Disconnect VIAS control solenoid valve harness connector. 1. Stop engine. 2. Disconnect VIAS control solenoid valve harness connector. 3. Turn ignition switch "ON". 4. Check voltage between terminal 1 and ground with CONSULT-II or tester. Voltage: Battery voltage Voltage: Battery voltage OK or NG

### 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- 15A fuse

OK

NG

• Harness continuity between fuse and VIAS control solenoid valve

GO TO 4.

GO TO 3.

Repair harness or connectors.

### 4 CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between ECM terminal 16 and terminal 2. Refer to Wiring Diagram.

### Continuity should exist.

4. Also check harness for short to ground and short to power.

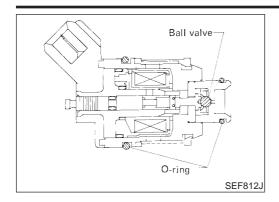
	OK	or	NG
--	----	----	----

OK I	<b></b>	GO TO 5.
NG	<b></b>	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

5	RETEST OVERALL FUNCTION		
Reconnect harness connectors disconnected.     Perform Test No. 1 again.			
OK or NG			
OK	<b>•</b>	INSPECTION END	
NG	<b>•</b>	GO TO 6.	

6	CHECK INTERMITTENT INCIDENT		
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
OK or NG			
OK	<b>&gt;</b>	Replace VIAS control solenoid valve as intake manifold collector assembly.	
NG	<b>&gt;</b>	Repair or replace harness or connectors.	



### **Component Description**

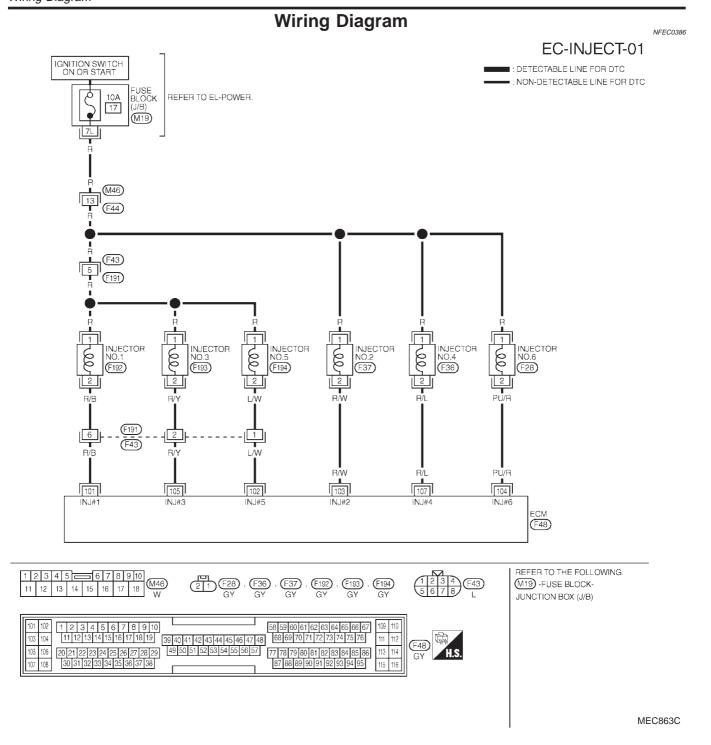
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

### **CONSULT-II** Reference Value in Data Monitor Mode

NFEC0384

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B2 INJ PULSE-B1	<ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul>	Idle	2.4 - 3.2 msec
	<ul><li>Shift lever: "N"</li><li>No-load</li></ul>	2,000 rpm	1.9 - 2.8 msec
B/FUEL SCHDL	ditto	Idle	2.0 - 3.2 msec
	unto	2,000 rpm	1.4 - 2.6 msec



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

	The test of transfer of the deep attention of the transfer of the design of the design.				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)	
101 102 103 104 105 107	L/W R/W	INJECTOR NO. 1 INJECTOR NO. 5 INJECTOR NO. 2 INJECTOR NO. 6 INJECTOR NO. 3 INJECTOR NO. 4	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	BATTERY VOLTAGE  (V) 15 10 0 100 ms	

SEF862Y

### **Diagnostic Procedure**

IEEC0207

1	INSPECTION START		
	Turn ignition switch to "START".  Is any cylinder ignited?		
Yes or No			
Yes	<b>•</b>	60 TO 2.	
No	<b>•</b>	60 TO 3.	

### 2 CHECK OVERALL FUNCTION

### With CONSULT-II

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

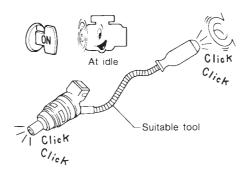
ACTIVE TES	Г	
POWER BALANCE		
MONITOR		
ENG SPEED	XXX rpm	
MAS AIF SE-B1	xxx v	
IACV-AAC/V	XXX step	

SEF070Y

3. Make sure that each circuit produces a momentary engine speed drop.

### Without CONSULT-II

- 1. Start engine.
- 2. Listen to each injector operating sound.



MEC703B

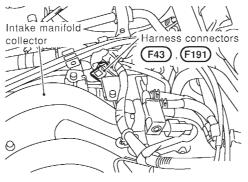
Clicking noise should be heard.

OK or NG

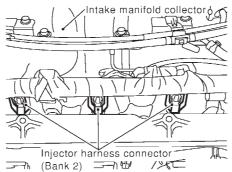
OK •	INSPECTION END
NG ►	GO TO 3.

### 3 CHECK INJECTOR POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect injector harness connectors (bank 2) and harness connectors F43, F191 (bank 1).

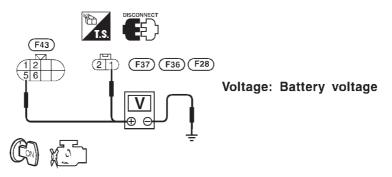


SEF276X



SEF281XA

- 3. Turn ignition switch "ON".
- 4. Check voltage between injector terminal 1 and ground, harness connector F43 terminal 5 and ground with CONSULT-II or tester.



SEF897X

OK or NG

OK •	GO TO 5.
NG •	GO TO 4.

### 4 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Harness connectors F43, F191
- Fuse block (J/B) connector M19
- 10A fuse
- Harness for open or short between injector and fuse
- Harness for open or short between harness connector F43 and fuse

Repair harness or connectors.

## **INJECTOR**

## 5 CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector.
- 3. Check harness continuity between injector terminal 2 and ECM terminals 103, 104, 107, harness connector F191 terminals 6, 2, 1 and ECM terminals 101, 105, 102. Refer to Wiring Diagram.

## Continuity should exist.

4. Also check harness for short to ground and short to power.

### OK or NG

OK •	GO TO 7.
NG ►	GO TO 6.

## 6 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F43, F191
- Harness for open or short between harness connector F191 and ECM
- Harness for open or short between ECM and injector

Repair open circuit or short to ground or short to power in harness or connectors.

## 7 CHECK SUB-HARNESS CIRCUIT FOR OPEN AND SHORT (BANK 1)

- 1. Remove intake manifold collector.
- 2. Disconnect injector harness connectors (bank 1).
- 3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

Harness connector F191	Injector F192, F193, F194
5	1
6, 2, 1	2

MTBL0359

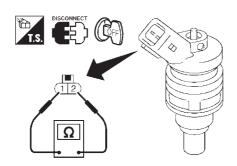
## Continuity should exist.

## OK or NG

OK •	GO TO 8.
NG •	Repair open circuit or short to ground or short to power in harness or connectors.

## 8 CHECK INJECTOR

- 1. Disconnect injector harness connector.
- 2. Check resistance between terminals as shown in the figure.



Resistance: 14 - 15 $\Omega$  [at 20°C (68°F)]

SEF964X

OK or NG
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OK ►	GO TO 9.
NG ►	Replace injector.

## **INJECTOR**

## Diagnostic Procedure (Cont'd)

9	CHECK INTERMITTENT INCIDENT		
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	<b>&gt;</b>	INSPECTION END	

## **START SIGNAL**

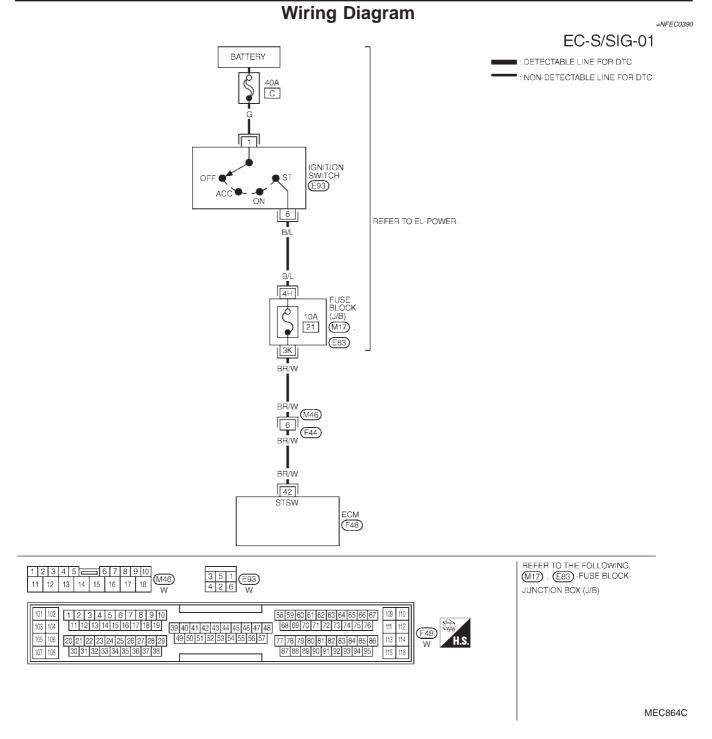
CONSULT-II Reference Value in Data Monitor Mode

## **CONSULT-II** Reference Value in Data Monitor Mode

## Specification data are reference values.

NFEC0388

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	• Ignition switch: $ON \rightarrow START \rightarrow ON$	$OFF \to ON \to OFF$



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
12	42 BR/W	START SIGNAL	IGN ON	APPROX 0V
42   DH/	DH/ ¥¥		IGN START	9 - 12V

SEF638XB

## **Diagnostic Procedure**

NFEC0391

1	INSPECTION START		
Do yo	Do you have CONSULT-II?		
		Yes or No	
Yes	<b>•</b>	GO TO 2.	
No	<b>•</b>	GO TO 3.	

## 2 CHECK OVERALL FUNCTION

## (P) With CONSULT-II

- 1. Turn ignition switch "ON".
- 2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
START SIGNAL	OFF
CLSD THL POS	ON
AIR COND SIG	OFF
P/N POSI SW	ON

Condition	"START SIGNAL"
Ignition switch "ON"	OFF
Ignition switch "START"	ON

SEF072Y

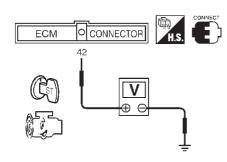
## OK or NG

OK	<b></b>	INSPECTION END
NG	<b></b>	GO TO 4.

## 3 CHECK OVERALL FUNCTION

## Without CONSULT-II

Check voltage between ECM terminal 42 and ground under the following conditions.



Condition	Voltage
Ignition switch "START"	Battery voltage
Other positions	Approximately 0V

SEF362X

## OK or NG

OK	<b>&gt;</b>	INSPECTION END
NG	•	GO TO 4.

## 4 CHECK STARTING SYSTEM

Turn ignition switch "OFF", then turn it to "START".

Does starter motor operate?

## Yes or No

Yes		GO TO 5.
No	<b></b>	Refer to SC-12, "STARTING SYSTEM".

## START SIGNAL

## Diagnostic Procedure (Cont'd)

5	CHECK FUSE		
2. Dis	<ol> <li>Turn ignition switch "OFF".</li> <li>Disconnect 10A fuse.</li> <li>Check if 10A fuse is OK.</li> </ol>		
	OK or NG		
ОК	<b>&gt;</b>	GO TO 6.	
NG	<b>•</b>	Replace 10A fuse.	

## 6 CHECK START SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Disconnect ignition switch harness connector.
- 3. Check harness continuity between ECM terminal 42 and fuse block, ignition switch and fuse block. Refer to Wiring Diagram.

## Continuity should exist.

4. Also check harness for short to ground and short to power.

## OK or NG

OK ▶	GO TO 8.
NG ▶	GO TO 7.

## 7 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M46, F44
- Fuse block (J/B) connectors M17, E83
- Harness for open or short between ignition switch and fuse
- Harness for open or short between ECM and fuse

Repair open circuit or short to ground or short to power in harness or connectors.

## 8 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.

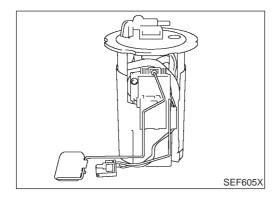
► INSPECTION END

## **FUEL PUMP**

# Sensor Input Signal to ECM ECM function Actuator Crankshaft position sensor (POS) Engine speed (POS signal) Crankshaft position sensor (REF) Engine speed (REF signal) Ignition switch Start signal

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 120° signal from the crankshaft position sensor (REF), it knows that the engine is rotating, and causes the pump to operate. If the 120° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation	
Ignition switch is turned to ON.	Operates for 1 second.	
Engine running and cranking	Operates.	
When engine is stopped	Stops in 1.5 seconds.	
Except as shown above	Stops.	



## **Component Description**

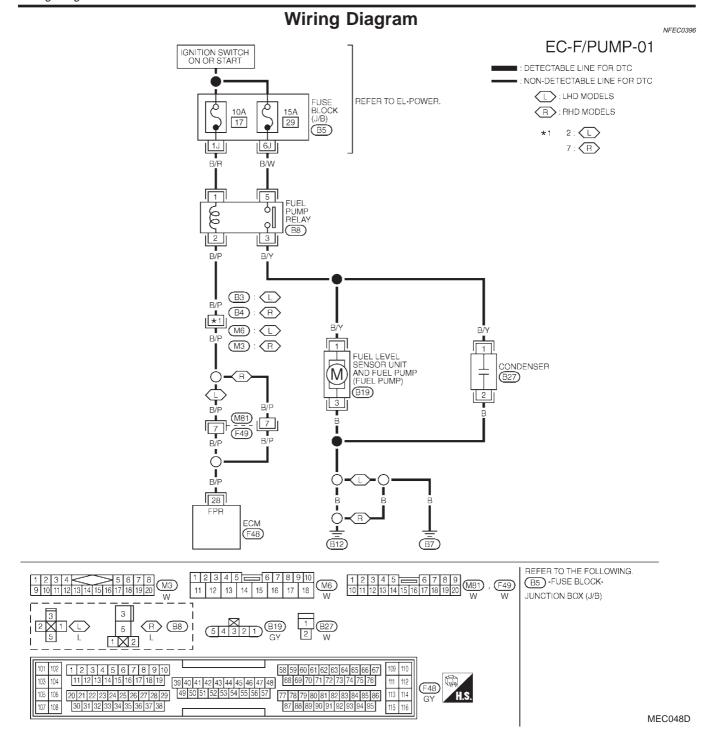
The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

## **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	<ul> <li>Ignition switch is turned to ON. (Operates for 1 second.)</li> <li>Engine running and cranking</li> </ul>	ON
	Except as shown above	OFF

NFEC0394



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE LOW O'THANGOTOTI. GOL A GROOMS OTHER THAN LOW TERMINALS; GOOT AG THE GROOMS.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)	
			FOR 1 SECOND AFTER IGN ON	0 - 1.5V	
28 B/P FUEL PUMP RELAY	D/D	ELIEL DUMB DELAY	ENGINE RUNNING	0 - 1.54	
	MORE THAN 1 SECOND AFTER IGN ON	BATTERY VOLTAGE (11 - 14V)			

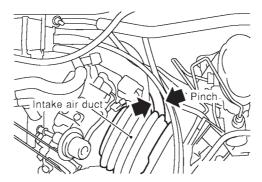
SEF639XB

## **Diagnostic Procedure**

NFEC0397

## 1 CHECK OVERALL FUNCTION

- 1. Turn ignition switch "ON".
- 2. Pinch fuel feed hose with two fingers.



orrene)

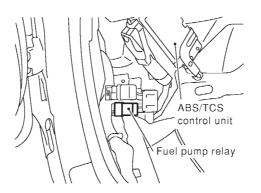
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned "ON".

## OK or NG

OK ▶	INSPECTION END
NG ▶	GO TO 2.

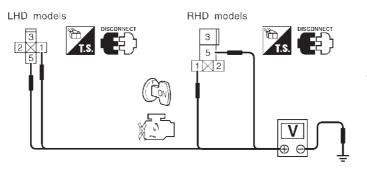
## 2 CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect fuel pump relay.



SEF284X

- 3. Turn ignition switch "ON".
- 4. Check voltage between terminals 1, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF310Y

OK	<b>•</b>	GO TO 4.
NG		GO TO 3.

OK or NG

## 3 DETECT MALFUNCTIONING PART

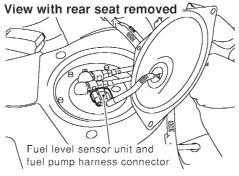
Check the following.

- Fuse block (J/B) connector B5
- 10A fuse
- 15A fuse
- · Harness for open or short between fuse and fuel pump relay

Repair harness or connectors.

## 4 CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF263X

3. Check harness continuity between fuel pump terminal 3 and body ground, fuel pump terminal 1 and fuel pump relay terminal 3. Refer to Wiring Diagram.

## Continuity should exist.

4. Also check harness for short to ground and short to power.

### OK or NG

OK •	GO TO 6.
NG ►	GO TO 5.

## 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between fuel pump relay and fuel pump
- Harness for open or short between fuel pump and body ground

Repair open circuit or short to ground or short to power in harness or connectors.

## 6 CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 28 and fuel pump relay terminal 2. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

## OK or NG

OK	<b></b>	GO TO 8.
NG	<b></b>	GO TO 7.

## 7 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M6 or B4, M3
- Harness connectors M81, F49
- Harness for open or short between ECM and fuel pump relay

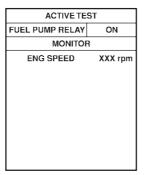
▶ Repair open circuit or short to ground or short to power in harness or connectors.

## **FUEL PUMP**

## 8 CHECK FUEL PUMP RELAY

## (P) With CONSULT-II

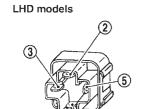
- 1. Reconnect fuel pump relay, fuel level sensor unit and fuel pump harness connector and ECM harness connector.
- 2. Turn ignition switch "ON".
- 3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT-II and check operating sound.

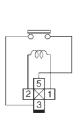


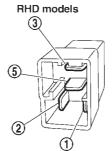
SEF073Y

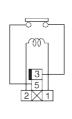
## Without CONSULT-II

Check continuity between terminals 3 and 5 under the following conditions.









Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

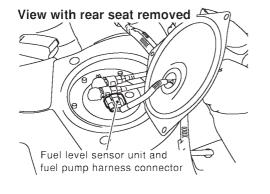
SEF367Z

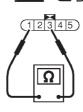
## OK or NG

OK	GO TO 9.
NG	Replace fuel pump relay.

## 9 CHECK FUEL PUMP

- 1. Disconnect fuel level sensor unit and fuel pump harness connector.
- 2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 3.





Resistance: 0.2 - 5.0 Ω [at 25°C (77°F)]

SEF609X

OK	or	NG
----	----	----

OK ►	GO TO 10.
NG ▶	Replace fuel pump.

## **FUEL PUMP**

## Diagnostic Procedure (Cont'd)

10	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		

## **ELECTRONIC CONTROLLED ENGINE MOUNT**

System Description

System Description  NFECO598			
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)	Engine mount control	Electronic controlled engine mount
Vehicle speed sensor	e speed sensor Vehicle speed		3

The ECM controls the engine mount operation corresponding to the engine speed and the vehicle speed. The control system has 2-step control [soft/hard].

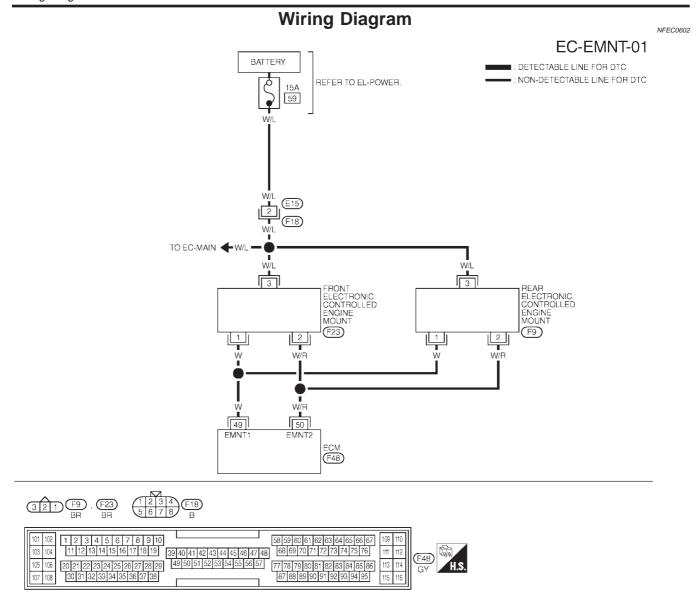
Vehicle condition	Engine mount control
Idle (with vehicle stopped)	Soft
Driving	Hard

## **CONSULT-II Reference Value in Data Monitor Mode**

Specification data are reference values.

NFEC0600

MONITOR ITEM	CONE	DITION	SPECIFICATION
ENCINE MOUNT	• Enginer Bunning	Idle	"IDLE"
ENGINE MOUNT	Engine: Running	2,000 rpm	"TRVL"



MEC866C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:

DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
49			ENGINE RUNNING AT IDLE SPEED	0 - 1.0V
49	**		ENGINE RUNNING AT 2,000 RPM	BATTERY VOLTAGE
50		ELECTRONIC CONTROLLED	ENGINE RUNNING AT IDLE SPEED	BATTERY VOLTAGE
50	¥¥/ □	ENGINE MOUNT-2	ENGINE RUNNING AT 2,000 RPM	0 - 1.0V

SEF640XB

## **ELECTRONIC CONTROLLED ENGINE MOUNT**

Diagnostic Procedure

## **Diagnostic Procedure**

NFEC0603

## CHECK THE OVERALL FUNCTION

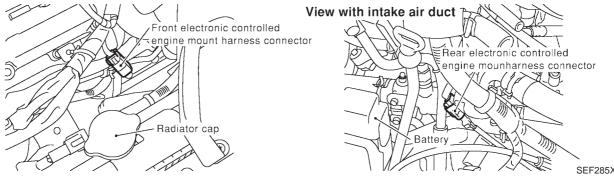
## (P) With CONSULT-II

- 1. After warming up engine, run it at idle speed.
- 2. Shift selector lever to "D" range while depressing the brake pedal and pulling the parking brake control lever.
- 3. Perform "ENGINE MOUNTING" in "ACTIVE TEST" mode with CONSULT-II and check that the body vibration changes according to switching the condition (With vehicle stopped).

SEC237C

## **⋈** Without CONSULT-II

- 1. After warming up engine, run it at idle speed.
- 2. Shift selector lever to "D" range while depressing the brake pedal and pulling the parking brake control lever.
- 3. Disconnect front or rear electronic controlled engine mount harness connector when engine speed is more than 1,000 rpm.



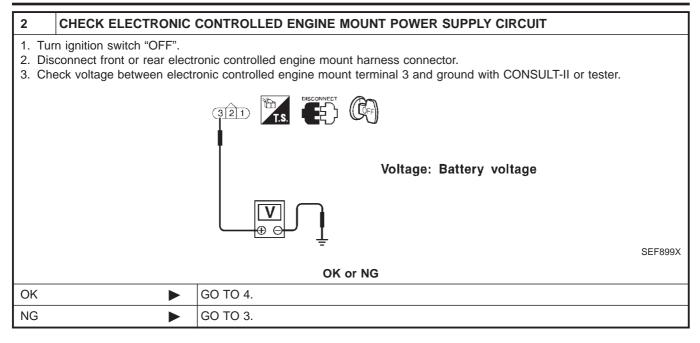
4. When returning engine speed to idle speed, check that the body vibration increases, compared with the condition of the above step 2 (With vehicle stopped).

OK or NG

	OK ►	INSPECTION END
ſ	NG ►	GO TO 2.

## **ELECTRONIC CONTROLLED ENGINE MOUNT**

Diagnostic Procedure (Cont'd)



3	DETECT MALFUNCTIONING PART		
Check the following.			
Harness connectors E15, F18			
	• 15A fuse		
• Har	Harness for open or short between electronic controlled engine mount and battery		
		Repair harness or connectors.	

## 4 CHECK ELECTRONIC CONTROLLED ENGINE MOUNT OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

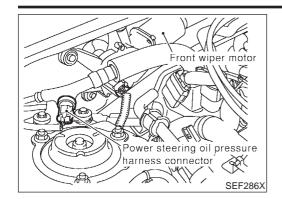
- 1. Disconnect ECM harness connector.
- Check harness continuity between ECM terminal 49 and electronic controlled engine mount terminal 1, ECM terminal 50 and electronic controlled engine mount terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
- 3. Also check harness for short to ground and short to power.

OK or NG		
OK ►	GO TO 5.	
NG ►	Repair open circuit, short to ground or short to power in harness connectors.	

5	CHECK ELECTRONIC CONTROLLED ENGINE MOUNT		
Visually check front and rear electronic controlled engine mount.			
	OK or NG		
OK	<b>&gt;</b>	GO TO 6.	
NG	<b>•</b>	Replace front or rear engine mount assembly.	

6	CHECK INTERMITTENT INCIDENT	
Refer	to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.	
► INSPECTION END		

Component Description



## **Component Description**

NEEGOOO

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

## **CONSULT-II Reference Value in Data Monitor Mode**

NFEC0399

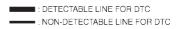
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL		Steering wheel in neutral position (forward direction)	OFF
	the engine	The steering wheel is fully turned.	ON

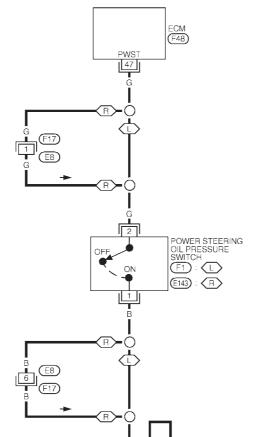
## **Wiring Diagram**

NFEC0401

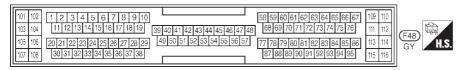
## EC-PST/SW-01



L: LHD MODELS R: RHD MODELS







(F41)

(F39)

MEC931C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND. CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
47		FOWEN STEENING OIL	ENGINE RUNNING WITH STEERING WHEEL BEING FULLY TURNED	0 - 1.0V
47	G		ENGINE RUNNING WITH STEERING WHEEL NOT BEING TURNED	BATTERY VOLTAGE

SEF641XB

Diagnostic Procedure

## **Diagnostic Procedure**

## 2 CHECK OVERALL FUNCTION

## (P) With CONSULT-II

- 1. Start engine.
- 2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

DATA MONITOR			
MONITOR	NO DTC		
PW/ST SIGNAL	OFF		
l			

Conditions	PW/ST SIGNAL
Steering is in neutral position	OFF
Steering is turned	ON

SEF311Y

## OK or NG

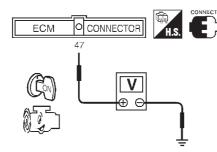
OK •	INSPECTION END
NG ►	GO TO 4.

## 3 CHECK OVERALL FUNCTION

## Without CONSULT-II

1. Start engine.

2. Check voltage between ECM terminal 47 and ground under the following conditions.



Conditions	Voltage
Steering is neutral position.	Approximately 5V
Steering is turned to full position.	Approximately 0V

SEF363X

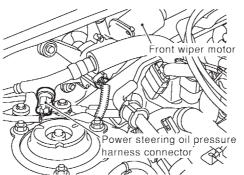
OK or NG

OK •	INSPECTION END
NG ►	GO TO 4.

Diagnostic Procedure (Cont'd)

## 4 CHECK POWER STEERING OIL PRESSURE SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Disconnect power steering oil pressure switch harness connector.



SEF286X

Check harness continuity between power steering oil pressure switch terminal 1 and engine ground. Refer to Wiring Diagram.

### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK	or	N	G
----	----	---	---

OK	GO TO 6.
NG	GO TO 5.

## 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F17, E8 (RHD models)
- Harness for open or short between power steering oil pressure switch and body ground

Repair open circuit or short to ground or short to power in harness or connectors.

## 6 CHECK POWER STEERING OIL PRESSURE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 47 and power steering oil pressure switch terminal 2. Refer to Wiring Diagram.

## Continuity should exist.

3. Also check harness for short to ground and short to power.

## OK or NG

OK •	GO TO 8.
NG ►	GO TO 7.

## 7 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F17, E8 (RHD models)
- Harness for open or short between power steering oil pressure switch and ECM
  - Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

## 

9	CHECK INTERMITTENT INCIDENT				
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.				
	► INSPECTION END				

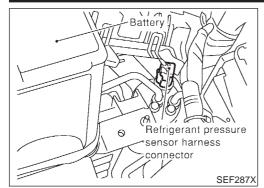
Replace power steering oil pressure switch.

GO TO 9.

OK NG

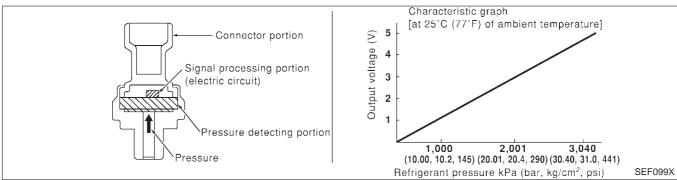
## REFRIGERANT PRESSURE SENSOR

## Description



## **Description**

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



## **Wiring Diagram** NFEC0637 EC-RP/SEN-01 REFRIGERANT PRESSURE SENSOR : DETECTABLE LINE FOR DTC : NON-DETECTABLE LINE FOR DTC (E37) A: WITH A/T 3 L: LHD MODELS R: RHD MODELS 4 : L 5: R 8: 🕒 10 : R 42 58 GND-A TCM (TRANSMISSION CONTROL MODULE) ECM F48 (F50): (A) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 39 40 41 42 43 44 45 46 47 48 (F48) 20 21 22 23 24 25 26 27 28 29 77 78 79 80 81 82 83 84 85 86 30 31 32 33 34 35 36 37 38 87 88 89 90 91 92 93 94 95 MEC868C

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
58	В	SENSOR'S GROUND	ENGINE RUNNING AT IDLE SPEED UNDER WARM-UP CONDITION	ov
81		REFRIGERANT PRESSURE SENSOR	ENGINE RUNNING UNDER WARM-UP CONDITION WITH A/C SWITCH AND BLOWER SWITH ON	0.36 - 3.88V
111	R	SENSOR'S POWER SUPPLY	IGN ON	APPROX. 5V

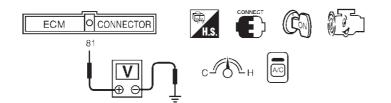
SEF643XB

## **Diagnostic Procedure**

NFEC0638

## 1 CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower switch "ON".
- 3. Check voltage between ECM terminal 81 and ground with CONSULT-II or tester.



Voltage: 0.36 - 3.88V

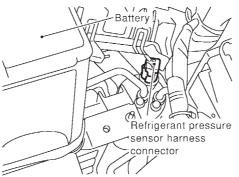
SEF617X

OK or NG

OK	•	INSPECTION END
NG	•	GO TO 2.

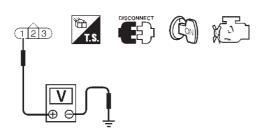
## 2 CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 1. Turn A/C switch and blower switch "OFF".
- 2. Stop engine.
- 3. Disconnect refrigerant pressure sensor harness connector.



SEF287X

- 4. Turn ignition switch "ON".
- 5. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF618X

OK or NG

OK •	GO TO 4.
NG ►	GO TO 3.

## REFRIGERANT PRESSURE SENSOR

Diagnostic Procedure (Cont'd)

## 3 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E15, F18
- Harness for open or short between ECM and refrigerant pressure sensor

Repair harness or connectors.

## 4 CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between refrigerant pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram. Continuity should exist.
- 3. Also check harness for short to ground and short to power.

### OK or NG

OK	<b>•</b>	GO TO 6.
NG	<b>•</b>	GO TO 5.

## 5 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E8, F17
- Harness for open or short between ECM and refrigerant pressure sensor
- Harness for open or short between TCM (Transmission control module) and refrigerant pressure sensor
  - Repair open circuit or short to ground or short to power in harness or connectors.

## 6 CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check harness continuity between ECM terminal 81 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

## Continuity should exist.

3. Also check harness for short to ground and short to power.

## OK or NG

ı	OK	GO TO 8.
	NG	GO TO 7.

## 7 DETECT MALFUNCTIONING PART

Check the following.

NG

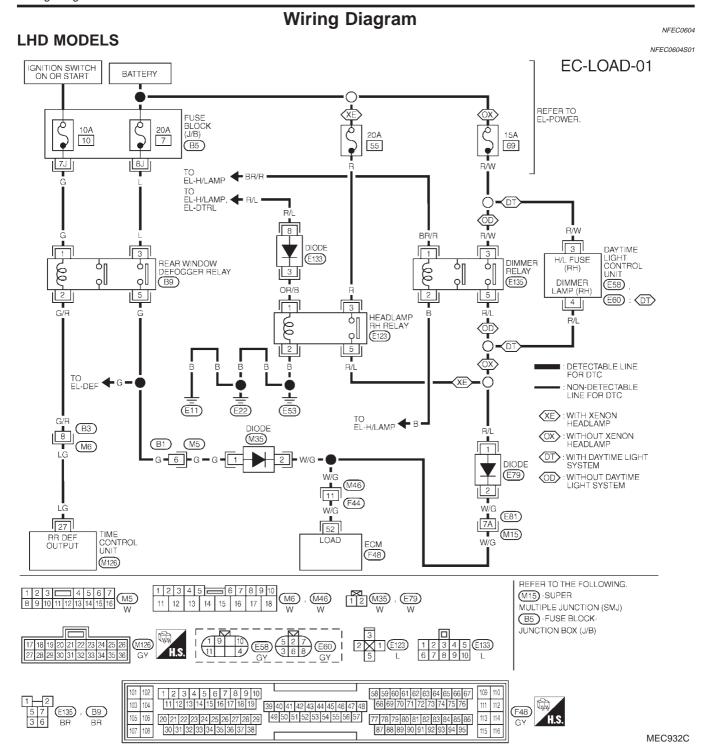
- Harness connectors E8, F17
- Harness for open or short between ECM and refrigerant pressure sensor

Repair open circuit or short to ground or short to power in harness or connectors.

## 8 CHECK REFRIGERANT PRESSURE SENSOR Refer to HA-85, "Refrigerant pressure sensor". OK or NG OK ▶ GO TO 9.

Replace refrigerant pressure sensor.

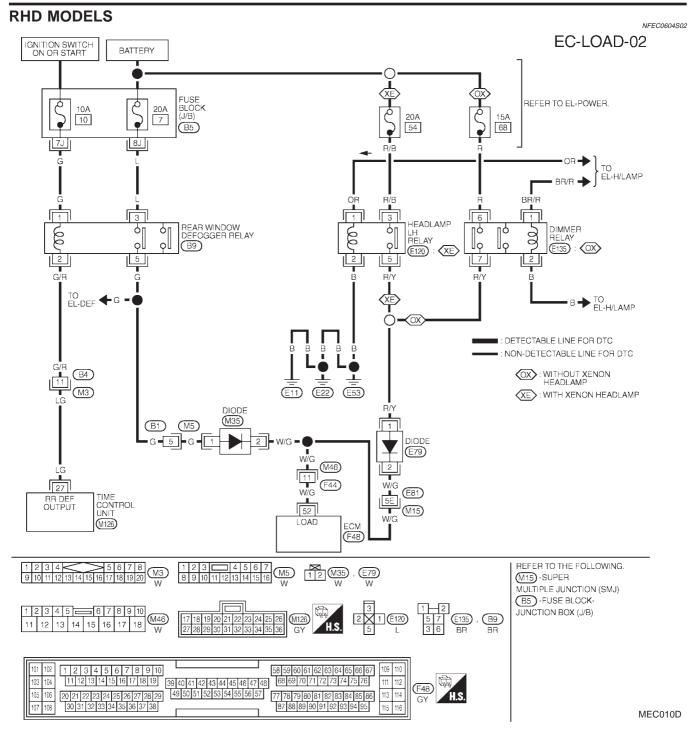
9	CHECK INTERMITTENT INCIDENT		
Refer	Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.		
	► INSPECTION END		



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE LOW S THANSISTON. USE A GHOOM OTHER THAN COM TERMINALS, SOUTH AS THE GHOOMS.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)	
52	W/G	ELECTRICAL LOAD SIGNAL	IGN ON WITH REAR WINDOW DEFOGGER SWITCH ON OR LIGHTING SWITCH ON AT 1ST POSITION	BATTERY VOLTAGE	
			IGN ON UNDER EXCEPT ABOVE CONDITION	0V	



ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND.

CAUTION:
DO NOT USE ECM GROUND TERMINALS WHEN MEASURING INPUT/OUTPUT VOLTAGE. DOING SO MAY RESULT IN DAMAGE TO THE ECM'S TRANSISTOR. USE A GROUND OTHER THAN ECM TERMINALS, SUCH AS THE GROUND.

TO THE EO	TO THE EDW S THANSISTON. USE A GHOUND OTHER THAN EDW FERMINAES, SOUTH AS THE GHOUND.					
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)		
52	W/G		IGN ON WITH REAR WINDOW DEFOGGER SWITCH ON OR LIGHTING SWITCH ON AT 1ST POSITION	BATTERY VOLTAGE		
			IGN ON UNDER EXCEPT ABOVE CONDITION	ov		

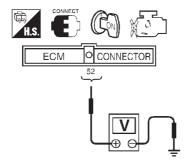
SEF642XB

## **Diagnostic Procedure**

NFEC0605

## 1 CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

- 1. Turn ignition switch "ON".
- 2. Check voltage between ECM terminal 52 and ground under the following conditions.



Condition	Voltage
Rear window defogger switch "ON"	BATTERY VOLTAGE
Rear window defogger switch "OFF"	OV

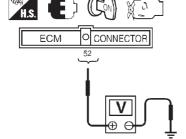
SEF610X

## OK or NG

OK	<b>&gt;</b>	GO TO 2.
NG	<b>•</b>	GO TO 3.

## 2 CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Check voltage between ECM terminal 52 and ground under the following conditions.



Condition	Voltage
Lighting switch "ON" at 2nd position	BATTERY VOLTAGE
Lighting switch "OFF"	0V

SEF611XA

## OK or NG

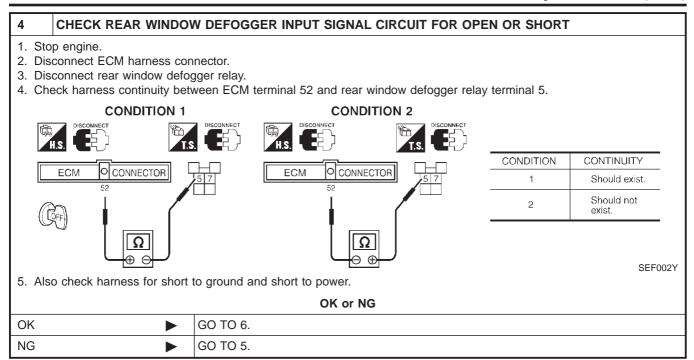
Oł	<b>★</b>	INSPECTION END
NO	<b>S</b>	GO TO 7.

## 3 CHECK REAR WINDOW DEFOGGER FUNCTION

- 1. Start engine.
- 2. Turn "ON" the rear window defogger switch.
- 3. Check the rear windshield. Is the rear windshield heated up?

## Yes or No

Yes	GO TO 4.
No •	Refer to EL-174, "Rear Window Defogger".



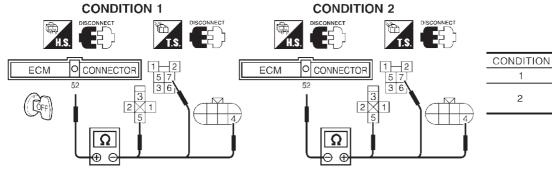
5	DETECT MALFUNCTIONING PART				
Check	Check the following.				
• Har	Harness connectors B1, M5				
• Har	Harness connectors M46, F44				
<ul><li>Dioc</li></ul>	• Diode M35				
• Har	<ul> <li>Harness for open and short between ECM and rear window defogger relay</li> </ul>				
	<b>&gt;</b>	Repair open circuit or short to ground or short to power in harness or connectors.			

6	6 CHECK INTERMITTENT INCIDENT					
Perform	Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.					
	<b>&gt;</b>	INSPECTION END				

7	7 CHECK HEADLAMP FUNCTION				
2. Tu	<ol> <li>Start engine.</li> <li>Turn the lighting switch "ON" at 2nd position with high beam.</li> <li>Check that headlamps are illuminated.</li> </ol>				
	OK or NG				
	Models with con- onal type head-	<b>&gt;</b>	GO TO 8.		
OK (Models with xenon type headlamp)		<b>&gt;</b>	GO TO 10.		
NG		<b></b>	Refer to EL-41, EL-47, "System Description".		

## 8 CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

- 1. Stop engine.
- 2. Disconnect ECM harness connector.
- 3. Disconnect daytime light control unit harness connector (Models with daytime light system), dimmer relay (Models without daytime light system).
- 4. Check harness continuity between ECM terminal 52 and daytime light control unit terminal 4 or dimmer relay terminal 5 (LHD models), 7 (RHD models) under the following conditions.



5. Also check harness for short to ground and short to power.

### OK or NG

OK •	GO TO 12.
NG ►	GO TO 9.

## 9 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E81, M15
- Harness connectors M46, F44
- Diode E79
- Harness for open and short between ECM and headlamp RH relay or dimmer relay
  - Repair open circuit or short to ground or short to power in harness or connectors.

CONTINUITY

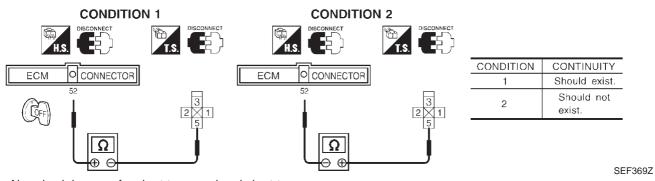
Should exist.

Should not

SEF368Z

## 10 CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

- 1. Stop engine.
- 2. Disconnect ECM harness connector.
- 3. Disconnect headlamp RH relay (LHD models), headlamp LH relay (RHD models).
- 4. Check harness continuity between ECM terminal 52 and headlamp RH relay terminal or headlamp LH relay terminal 5 under the following conditions.



5. Also check harness for short to ground and short to power.

## OK or NG

OK •	GO TO 12.
NG	GO TO 11.

## **ELECTRICAL LOAD SIGNAL**

Diagnostic Procedure (Cont'd)

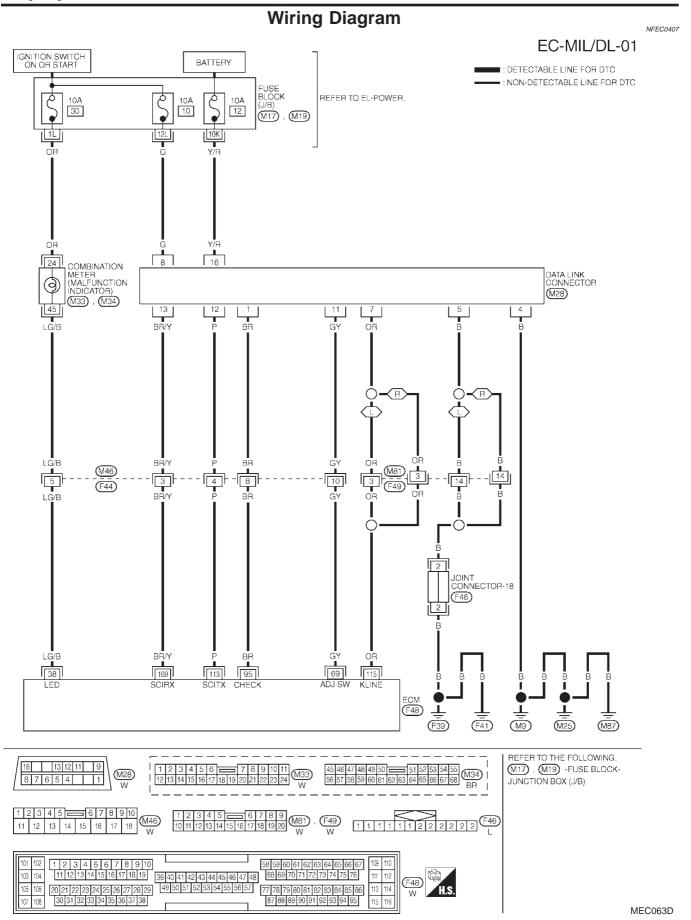
## 11 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E81, M15
- Harness connectors M46, F44
- Diode E79
- Harness for open and short between ECM and headlamp RH relay or headlamp LH relay

Repair open circuit or short to ground or short to power in harness or connectors.

12	CHECK INTERMITTENT INCIDENT			
Perfor	Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-131.			
	<b>•</b>	INSPECTION END		



## **SERVICE DATA AND SPECIFICATIONS (SDS)**

Fuel Pressure Regulator

	Fuel Pressur	e Regulato	or	NFEC040
Fuel pressure at idling kPa (b	par, kg/cm², psi)			
Vacuum hose is con	nected.	Approximately 235 (2.35, 2.4, 34)		
Vacuum hose is disco	nnected.	Approxi	mately 294 (2.94, 3.0, 43)	
	Idle Speed ar	nd Ignition	Timing	NFEC04
Target idle speed*1	No-load*2 (in "P" or N" position)		M/T: 625±50 rpm (VQ30DE) M/T: 675±50 rpm (VQ20DE) A/T: 700±50 rpm	10 200
Air conditioner: ON	In "P" or N" position		825 rpm or more	
Ignition timing*1	In "P" or N" position		9°±5° BTDC (VQ20DE) 15°±5° BTDC (VQ30DE)	
Throttle position sensor idle position			0.15 - 0.85V	
Supply voltage	Mass Air Fio		ery voltage (11 - 14)V	NFEC04
Electric load: OFF (Lights, heater fa Steering wheel: Kept in straight-ahe				
	Mass Air Flor	w Sensor		NFEC04
Supply voltage		Batt	ery voltage (11 - 14)V	
Output voltage at idle		1.2 - 1.8*V		
Mass air flow (Using CONSULT-II)		2.0 - 6.0 g·m/sec at idle* 7.0 - 20.0 g·m/sec at 2,500 rpm*		
Temperature °C		ant Temper	Resistance kΩ	NFEC04
20 (68)			2.1 - 2.9	
50 (122)		0.68 - 1.00		
90 (194)		0.236 - 0.260		
	EGR Tempera	ature Sens	or	NFEC04
EGR temperature °C (°F)	Voltage V		Resistance $M\Omega$	
0 (32)	4.61	61 0.68 - 1.11		
50 (122)	2.53		0.09 - 0.12	
100 (212)	0.87		0.017 - 0.024	
	Heated Oxyg	en Sensor	1 Heater (front)	NFEC04
Resistance [at 25°C (77°F)] 2.3 - 4.3Ω		2.3 - 4.3Ω		
	Fuel Pump			NFEC04
Resistance [at 25°C (77°F)]			0.2 - 5.0Ω	
	IACV-AAC Va	ılve		
Posistance (at 20%C /77%E\)			Approximately 220	NFEC04
Resistance [at 20°C (77°F)]		,	Approximately 22Ω	

## **SERVICE DATA AND SPECIFICATIONS (SDS)**

## Injector

	Injector			NFEC041
Resistance [at 20°C (68°F)]			14 - 15Ω	741 20077
	Resistor			
Resistance [at 25°C (77°F)]			Approximately 2.2 kΩ	NFEC041
	Throttle	Position Sen		
	Infollie	Position Sen	501	NFEC041
Throttle valve condition	ns		Voltage g temperature, engine off, ignition swit prottle opener disengaged)	ch ON,
Completely closed (a)			0.15 - 0.85V	
Partially open			Between (a) and (b)	
Completely open (b)			3.5 - 4.7V	
	Calculate	ed Load Valu	е	NFEC042
		Calculated	I load value % (Using CONSULT-II)	
At idle			14.0 - 33.0	
At 2,500 rpm			12.0 - 25.0	
	Intake Ai	r Temperatur	e Sensor	NFEC042
Temperature °C (°F)			Resistance kΩ	
20 (68)			2.1 - 2.9	
80 (176)			0.27 - 0.38	
	Heated C	xygen Senso	or 2 Heater (rear)	NFEC042
Resistance [at 25°C (77°F)]			2.3 - 4.3Ω	
	Cranksha	aft Position S	Sensor (REF)	NFEC042
Resistance [at 20°C (68°F)]			470 - 570Ω	
	Fuel Tan	k Temperatur	e Sensor	NFEC042
Temperature °C (°F)			Resistance kΩ	747 200 12
20 (68)		2.3 - 2.7		
50 (122)		0.79 - 0.90		
	Camshaf	t Position Se	ensor (PHASE)	NFEC063
	HITACHI make		1,440 - 7,760Ω	IVI ECOOS
Resistance [at 20°C (68°F)]	1			